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# Galileo

MAGAZINE OF SCIENCE & FICTION



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by Larry Niven

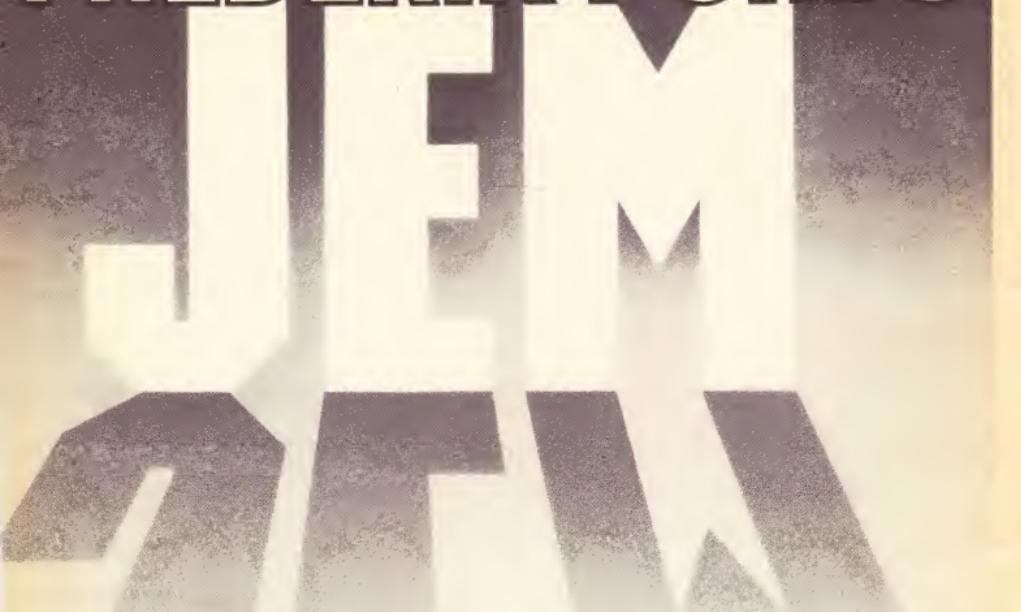


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# Contents

Volume II/Number 1

Gravely, George Grieve and compatriots from Security contemplate a Ringworld spaceport that Chmee, Hindmost, and Louis Wu are approaching as a disabled wanderer comes home to Janet the Coach's wife.

## ARTICLES

### ON THE TENTH OF APOLLO 11

by Hal Clement, Poul Anderson, Frank Herbert, J.E. Pournelle, Frederik Pohl, Clifford D. Simak ..... 10  
It's been ten years since Neil Armstrong took a giant leap for mankind. Are we in space or aren't we? Science fiction authors question the impact and aftermath of the greatest event of our time.

### INTERVIEW: H.L. Gold

by Jeffrey Elliot ..... 22  
Drowning for hire is only one of the curious anecdotes former *Galaxy* pioneering editor and SF author H.L. Gold has to relate. An unique perspective on some of the genre's more rambunctious moments.

## NOVEL

### THE RINGWORLD ENGINEERS:

Part I of Four Parts  
by Larry Niven ..... 54  
Twenty years have passed since Louis Wu and his kzin companion left the Ringworld. Now forced to return, they are given an impossible quest upon a world that is doomed. The author of the original classic gives its fans the sequel they have begged for...and more.

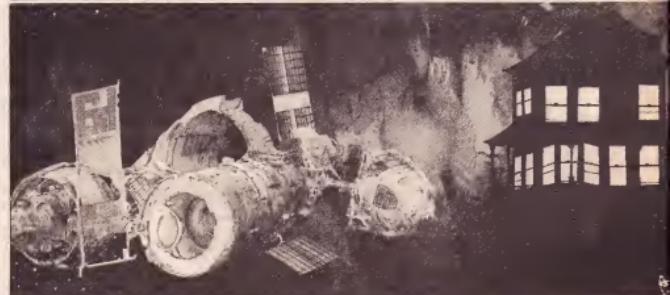
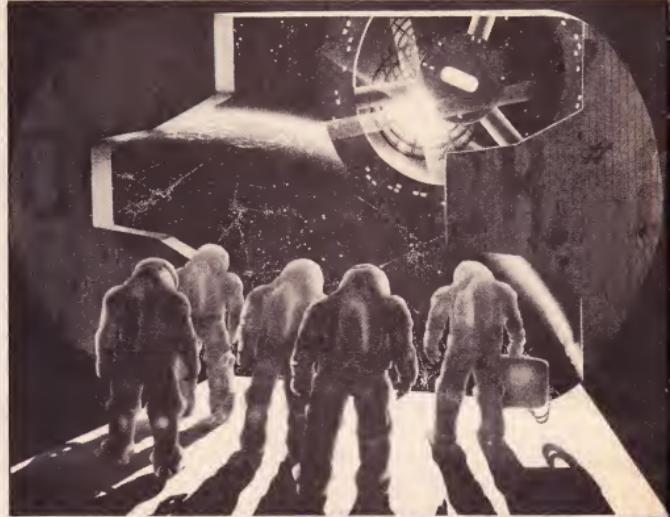
## STORIES

### CROSSWHEN

by John Kessel and Terry Lee ..... 27  
In which Justin Case and Mark Down are acquitted for reasons of incompetence. Our heroes begin a new adventure.

### GRAVE-II

by John Alfred Taylor ..... 32  
Space may be a new frontier, but the people who colonize will bring all of humanity's foibles with them, like politics and terrorists. And when those terrorists are armed, George Grieve has



to move his bioengineered body very carefully.

### HOMING PIGEON

by Connie Willis ..... 38  
Save the migrating whales? Ridiculous. Janet did, however, believe she could act like a lighthouse beacon upon an ocean much vaster than any on Earth.

### UNIVERSAL SOLDIER

by D.C. Poyer ..... 46  
There's no room for humanity on the battlefield. An old but sadly true lesson. Rolfe was perfect for it, and hardly human.

### JAHRATTA DKI

by George Florance-Guthridge ..... 48  
He was victorious over the finest cyborgs the world could produce and he was becoming an Olympic legend, until his human fault was discovered.

## DEPARTMENTS

### EDITORIAL

by Charles C. Ryan ..... 4  
Is there intelligent life on the newsstands?

### PROFILE

by Letty Hummel ..... 6  
The people of Gallileo #13 and how they came to be here.

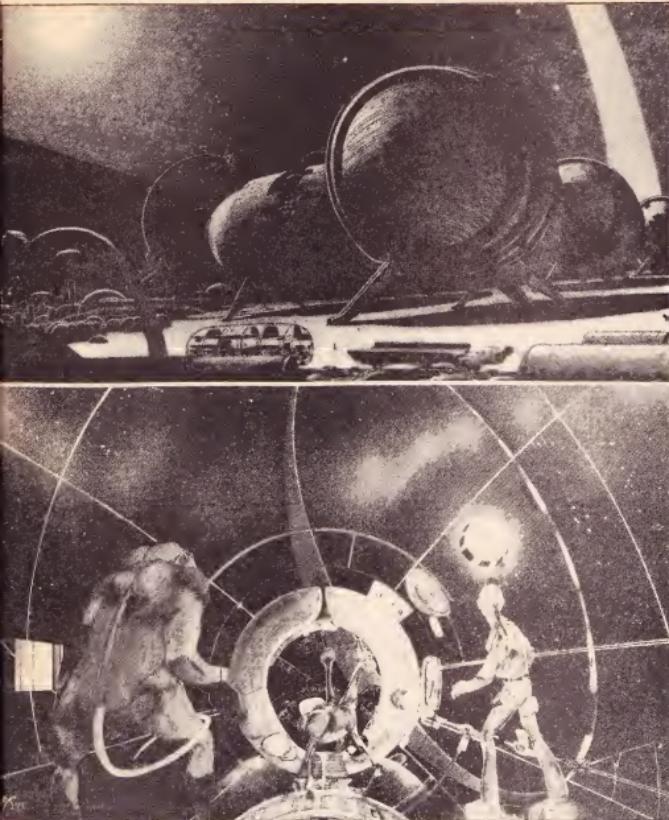
### SF ANSWERMAN

by [name withheld] ..... 8  
A plea for help from Putney Falls, Vermont.

### NASA NOTES

by Thomas L. Owen ..... 26  
From quasars to lower-body negative pressure in women.

# Staff



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## ABOUT OUR COVER

Turn over this issue of *Galileo* and open it up for the most spectacular view of the Ringworld you have ever seen. After reading *The Ringworld Engineers*, artist Courtney Skinner decided to paint this scene of the puppeteer's probe leaving the floating city after a rendezvous with Louis Wu.

<b>OPINION</b> by Robert Silverberg .....	92
Is it ebb tide for the New Wave?	
<b>THE ALEPH</b> by Andrew Adams Whyte .....	78
Brief looks at new books.	
<b>NEBULA AWARDS</b> .....	82
1978 winners announced.	
<b>REVIEWS</b> edited by Floyd Kemske.....	84
When is a book not a book?	
<b>TELESCOPE</b> .....	87
Our future foretold.	
<b>GAMES</b> by Marvin Kaye .....	88
Beginning a look at electronic games.	
Contents	

## ADVERTISERS

St. Martin's Press.....	fc
Stackpole Books.....	1
Galileo.....	5
Dial Press.....	7
Atheneum.....	9
Dell.....	25 & 93
Avenue Victor Hugo.....	31
Back Issues.....	81
Vulcan Binders.....	83
Edmund Scientific.....	95

# Galileo

Magazine of Science and Fiction

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How do we fool thee? Let us count the ways...

*Galileo* issue #11/12 published a circulation statement which reversed the information in the columns labeled "Single Issue nearest to filing date" and "Average Number of Copies during preceding months." Our circulation is not declining precipitously as might be inferred from the table.

Some of the calculations in David Gordon Wilson's article, "Human-Powered Space Transportation," in that same issue were based on the assumption that the moon has one-eighth the gravity of the earth. It does not change the import of the article in the least, but most of us around here realize that the correct figure is one-sixth. Dr. Wilson, who has never been to the moon, obtained the figure from a colleague in the geology department of MIT and no one caught the error. None of us has ever been to the moon, either (although Eugene Potter did note the correct figure further on).

On page twenty-one of that same issue, we published a drawing of a supine, semi-recumbent bicycle with the permission of its previous publisher, Rodale Press, but without acknowledgement. For the record, that drawing was previously published in the book *Pedal Power*, published in 1977 by Rodale Press of Emmaus, Pennsylvania 18049.

In that same issue, we published a review of the book *Robots, Robots, Robots* from the New York Graphic Society and failed to mention that it is from Little, Brown and Company of Boston, Massachusetts in cooperation with the New York Graphic Society.

Again in that issue, we failed to explain that both of the classy paintings which were used for the cover were done by the incomparable Tom Barber. It was Tom's fifth *Galileo* cover.

These might seem like quite a few mistakes, but it was a double issue and we wanted to make certain you got your money's worth.

Dell Distributing, Inc., is pleased to announce that its Display Program now includes *Galileo Magazine*, published by Avenue Victor Hugo, Publishers.

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# Editorial

Charles C. Ryan

T

HE RED SPOT, a multihued hurricane to which the earth would be but a speck in the eye; lo, a tiny moon bursting with volcanoes squeezed to its surface by Jupiter's tidal stress; a faint ring of debris encircling the gaseous giant itself—if Galileo Galilei were alive today, he would consider himself truly blessed. The tiny tool he fashioned to view the heavens has evolved and mutated into wonderous devices even he might never have dreamed of.

So, too, has *Galileo* magazine grown and changed since its modest birth as a quarterly publication three years ago. This issue is *Galileo's* equivalent of Voyager I—a probe into the (for us) unknown world of mass marketing. A stranger in a strange land.

For many of you, the discovery of *Galileo* on your local newsstand has come as a surprise, much the way that ring about Jupiter caught the astronomers at the Jet Propulsion Lab unawares. But, like the ring, *Galileo* has been around a while. This is our thirteenth, and not our first, issue. You haven't seen us before, because we came up the hard way. Printing only 8,000 copies of our first issue (now sold out), *Galileo* has sprouted slowly, surely, into what it is today—one of the largest magazines in the field. And, we hope you will agree, one of the best.

Some of you have been with us from the beginning, watching us grow and improve, and about half of you are among our faithful subscribers, and know what *Galileo* is about. I ask you to bear with me while I restate *Galileo's* philosophy.

Like Pioneer, Viking, and Voyager, *Galileo* is dedicated to the task of challenging and pushing back the frontiers of knowledge—to the idea that the conquest of space is our destiny. But we are also committed to the concept that fiction, as art, must entertain. It is perhaps more than a coincidence that Galileo Galilei and William Shakespeare were both born in 1564. Each was a master in his chosen field; Galileo giving us the first fruitful use of the scientific method, and Shakespeare providing us with an incomparable body of literature.

In *Galileo* we seek and publish stories which combine the best of both worlds,

a melding of scientific inquiry and entertaining prose. Lively stories. Tales crafted to relieve boredom and tickle curiosity. We do not seek or publish self-indulgent stories about quitters. Disasters and ennui may occur and exist, but only losers accept them as inevitable, as fate. You'll find no losers in these pages.

The manned space program of the United States has, in the eyes of five notable science fiction authors presented in this issue, undergone a sort of disaster. It is languishing, withering on the vine of politics and bureaucratic cowardice. But you won't find any of these reputable authors giving up. It is merely a temporary setback. As Frank Herbert says, "We are in space." And, even if the leaders of this country are undergoing a momentary loss of courage and vision, others are not. The Russians have every intention of orbiting and manning a space station. That alone should light a liquid hydrogen fire under some of this nation's more paranoid bureaucrats. As long as it remains in a cryogenic state, the cold war at least serves one useful purpose by keeping the space race alive (but only).

Which brings me back to the Voyager analogy. In addition to providing us with immeasurably valuable data and photographs of earth's celestial neighbors, Voyager has another purpose—to contact intelligent life, if it exists, in the universe. The probe carries a gold-coated-copper, long-playing phonograph record along with a stylus and instructions for its use. Thousands, or even millions, of years from now, that recording may constitute our race's first communication with another intelligent life-form.

In a more whimsical way, *Galileo's* venture into the mass market is also a probe which is attempting to determine if there is, as some claim, intelligent life on the newsstands.

Needless to say, if you are reading this, *Galileo's* mission has partly succeeded, it has encountered intelligent life. The only question which remains is: Is there enough intelligent life out there to make a difference? To *Galileo*? To the future of this planet? We think there is. But you have to help. Contact any other intelligent life-forms you may know and tell them about this attempt at communication. And, as you well know, communication is a two-way process, so return the message. Let us know what you think of this probe. Analyze it at your leisure and, by return mail let us know what you think.

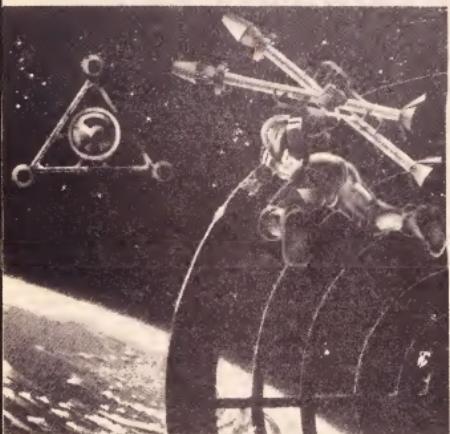
In the meantime, remember that Voyager II is on its way, as is the next issue of *Galileo*. Don't let it slip by. Intelligent life-forms have to stick together.

—G—

# The Courage To Dream...

This is the essence of Science Fiction. The spirit of our future is in the story of pioneers; the inner need for adventure, the love of truth, each individual's search for a place of his or her own. *Galileo* is the magazine of things to come. *Galileo* is the new magazine of great science fiction and the new frontiers of science fact. Articles by major scientists like Carl Sagan, David Wilson, and Arthur C. Clarke explore such topics as atomic and genetic research, astrophysics, and the coming computer technology. Reviews, interviews and previews are highlighted by Robert Silverberg, Marvin Kaye and David Gerrold on books, games and movies. Lighter subjects include fashions of the future, automobiles of tomorrow, and bicycles in space. Superb illustration by the

finest artists in the field titillate the imagination. But the best parts are the stories, where science becomes the future, by such authors as Harlan Ellison, Marion Zimmer Bradley, and Jack Williamson. Great novels like Larry Niven's long-awaited sequel THE RINGWORLD ENGINEERS are serialized complete and uncut. From pathos to adventure, from the horrific to visions of the ideal, it's yours.



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# Pro-File

## Letty Hummel

Clockwise from upper left: Larry Niven, Connie Willis, George Gauthier, John Alfred Taylor and D.C. Poyer.

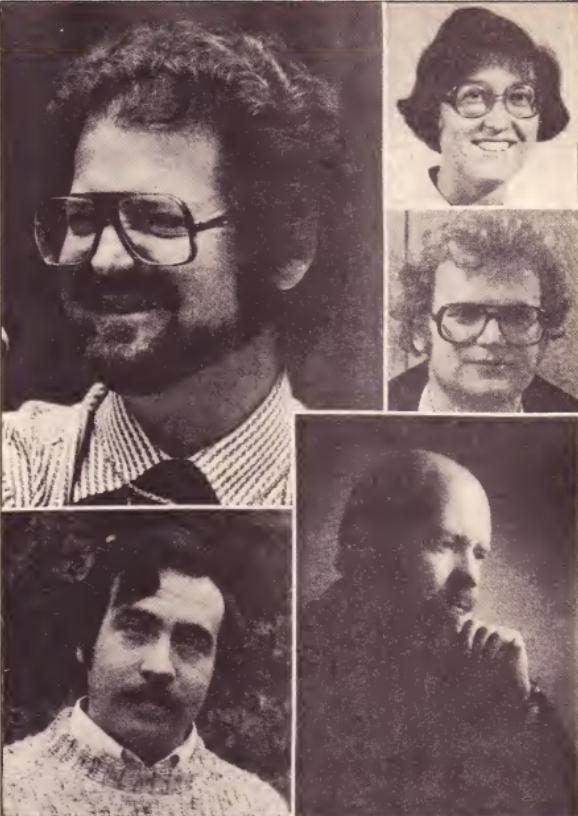


ACTS AND Fantasies... What's happening in the Space Program ten years after the first moon landing? What adventures will befall Louis Wu on his return to the Ringworld? *Galileo*'s first newsstand issue commemorates the anniversary of Apollo 11 with a two-part symposium featuring essays by distinguished scientists and science fiction writers. Part one in this issue focuses on the writers—Anderson, Clement, Herbert, Pohl, Pournelle, and Simak look back at the great event with a mixed vision of hope and frustration. And Larry Niven's long-awaited sequel to his classic *Ringworld* highlights our fiction section, beginning the first installment of "The Ringworld Engineers."

Hal Clement recently added a new dimension to his professional career: he's now *Galileo*'s Science Editor, and thus introduces our special Apollo 11 anniversary feature. A pre-eminent writer of the "hard" science fiction story, he is the author of such popular novels as *Mission of Gravity* and *Iceworld*. Science fiction lore has it that his now-classic *Needle*, considered the first true science fiction detective novel, was born from his irritation with the once popular dictum that a good science fiction detective story couldn't be written.

John Campbell published Poul Anderson's first science fiction story, "Tomorrow's Children" in *Astounding* in 1947. Since then, this multiple Hugo and Nebula award winner has written over 50 novels and 250 shorter works ranging from space opera and epics to high adventure, poetry, and mysteries. He is now famous for his fantastic futures, such as the Technic History and the History of Rustum, and such fabled characters as Dominic Flandry and Nicholas van Rijn. His latest SF

Photo Credit: Jay K. Klein



bestseller is *The Earthbook of Stormgate*. The title for our symposium, "On the Tenth of Apollo 11," was suggested by his article. A recent interview with Mr. Anderson appeared in issue 11-12.

Frank Herbert is best known as the author of *Dune*, an ecological *tour de force* that has become one of the most popular science fiction books ever written, and for which he received both a Hugo and Nebula award. In his 20-year career, the 59-year-old author has produced 38 short stories, three collections, and some 14 novels. His latest novel, *The Jesus Incident*, a sequel to *Destination: Void*, is a collaboration with William Ransom just published by Berkley-Putnam. In 1965, *Dune* set new standards for the complexity of world-building techniques and established a trend for epic-length science fiction novels. Two sequels, *Dune Messiah* and *Children of Dune*,

have surpassed the original in initial sales, and recently Herbert made history by selling the screen rights to *Dune* for a sum reported to be among the highest ever paid.

J.E. Pournelle is a science fiction writer who also happens to be a scientist in his own right, making him doubly qualified to speak on this issue's topic after working with NASA's space planning program for 15 years. His varied professional career includes working as a senior scientist at North American Aviation, as assistant Director of Research for the city of Los Angeles, and as a college professor at Pepperdine University. A very successful collaboration with Larry Niven has produced such novels as *Inferno* and *Lucifer's Hammer*.

Frederik Pohl has carved out a triple career in science fiction: distinguished writer, editor, and agent; he is the first

Photo Credit: Evans Studio

man in SF history to receive the Hugo for both his writing and editing talents. Another Golden Age writer, Pohl began his involvement with science fiction as a fan and was a member of the legendary Futurians, which was part of the organizing force that established what became the most famous of all fan traditions—the first World Science Fiction Convention in 1939. Pohl, who was editing his first magazine at 19, began writing under a series of pen names, the most famous being James McCreight. He succeeded H.L. Gold (the subject of our interview) as editor of *Galaxy* and *IF*. *Gateway*, his 1978 novel, is the only book to date that has won science fiction's three most prestigious awards: the Hugo, the Nebula, and the John W. Campbell, Jr. Trophy. His autobiography, *The Way the Future Was: A Memoir*, was published recently by Ballantine.

One of science fiction's most distinguished deans, Clifford D. Simak's career spans some five decades beginning with the 1931 publication of "The World of the Red Sun" in *Wonder Stories*. Almost all his novels are notable, but he is perhaps most famous for his *City* series collected from his stories in *Astounding*, where much of his early work was published. Since then his fiction has appeared in just about every SF magazine and his "How-2" served as the basis for the Broadway play *How to Make a Man*. Simak won his first Hugo in 1959 for the novelette, "The Big Front Yard" and another for best novel in 1964 with *Way Station*. He studied journalism at the University of Wisconsin, and in the sixties he was the News Editor of the Minneapolis *Star* where he also wrote a weekly science column. The Science Fiction Writers of America awarded him its most prestigious honor in 1976: the Grand Master Award. He is also the subject of this issue's "Star Chamber" feature.

Larry Niven is considered one of the most science-directed novelists of his generation. Born in Los Angeles in 1938, he made his first science fiction sale to *IF* in 1964, with the story "The Coldest Place." *Ringworld*, his modern-day classic published as a paperback in 1970, won both the Hugo and Nebula awards. Niven, who has studied at the Universities of California and Washburn, won his first Hugo for *Neutron Star* in 1967 and another for *Inconstant Moon* in 1972. During his fifteen-year career he has written 60 short stories and some 10 novels. His thriving collaboration with Jerry Pournelle is perhaps most famous for *The Mote in God's Eye*. Niven's sequel, "The Ringworld Engineers," featuring Louis Wu and Speaker-to-Animals, comes to the pages of *Galileo* in four 25,000-word

installments, beginning in this issue. It is scheduled for book publication in February 1980.

George Florance-Guthridge makes his first appearance in *Galileo* with "Jahrratt Dki," a story about an extraordinary Tibetan athlete who dazzles technicians and spectators alike with his performance at the New Olympics. Guthridge has taught nonfiction writing and advertising on the college level. His science fiction has appeared in *Analog*, *F&SF*, *Our Future Years*, and *Child Life*; and his mainstream stories have appeared in a variety of literary periodicals. Currently, he is working on three projects: an historical trilogy set in the 17th century; an illustrated western novel; and a book on real estate.

Now that he is a full-time freelance writer living in Norfolk, Va., D.C. Poyer says he's beginning to develop a working relationship with his subconsious. "Once it understood that paycheck days were over forever and that if it did not create neither of us ate, it started to work overtime... A lot of my writing is beginning to take place in my sleep. This is fortunate because I like to sleep a lot." He makes his third appearance in *Galileo* with "Universal Soldier."

Wouldn't a cyborg, despite his special abilities, be an ordinary man with ordinary problems? John Alfred Taylor says this question formed the basis for his second George Grieve story, "Grave-II." The first Grieve

[continued on page 95]



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# SPIDER AND JEANNE ROBINSON

## Stardance



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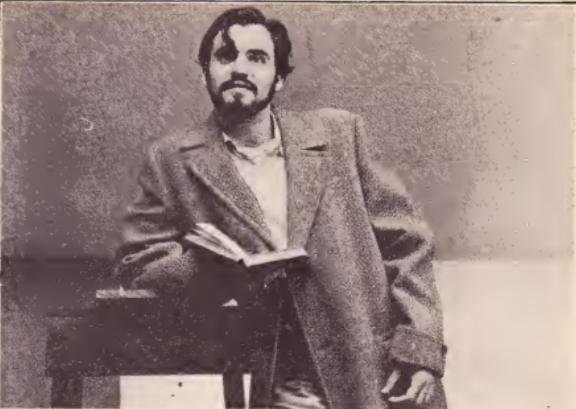
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# SF Answer Man

Have a question for the SF Answer Man? Address it to SF Answer Man, Galileo Magazine, 339 Newbury Street, Boston, MA 02115. The Answer Man says he will make a sincere effort to deal with all serious inquiries. Questions must be typed, in English, on paper. The Answer Man reserves the right to edit them and regards submission as consent to publication. He doesn't pay a dime for the letters he uses, either.

Photo Credit: Charles C. Parks



**D**EAR SF ANSWER MAN,  
I am writing to request your assistance with a problem.  
To introduce myself, I am Miss Amanda Porterfield, but don't let that "Miss" fool you; I haven't missed as much as certain people would like to believe. I was born and have lived all my life here in Putney Falls, with the exception of some time spent in Paris when I was a girl. My elder sister made what was considered a most advantageous marriage, but after considerable study of the situation, I resolved to marry, if at all, as disreputably as possible.

It was for that reason that, upon completion of my secondary school education, I elected to go to Paris to study art, despite the fact that I knew myself to be almost completely devoid of talent. In Paris, I quickly met a young man whom I considered disreputable enough and I was in the process of having an affair with him when my father arrived on the scene with the news that the young man, far from being disreputable, was in fact the heir to one of the most distinguished if impoverished titles in England. By that time, I believed myself pregnant, and though the young man (no doubt impressed with my father's prosperity) was interested in marriage, I determined pregnancy was disreputable enough and sent him packing.

It subsequently developed that I was not pregnant after all, but by the standards of the day I was sufficiently ruined, and so I accompanied my father home to Putney Falls, resolved to lead a more conventional life, a resolve I have adhered to with the brief exception of an interlude with a charming Italian music teacher.

I attended Normal School and ob-

tained a position as a mathematics teacher in the local school, a position I retained until I attained the age of fifty-four, at which time circumstances dictated an early retirement. I am now eighty-three years old, in sound mind and beholden to no one.

The two things about me which are particularly relevant to this account are first, that I am and have been for a number of years totally deaf and, second, that I enjoy taking long walks late at night.

The situation about which I am writing began on one of my nocturnal strolls about a year ago. I headed East from Putney Falls, crossed the old covered bridge and was about to cut through Norton's pasture when I sensed that I was not alone. I have stated that I am deaf, but it is necessary to point out that my other senses are if anything more acute than normal and I am frequently aware of things which other people fail to notice.

I thus became aware that there was another person (or persons; I was not then certain which) in the vicinity and I, of course, looked about. An elderly woman alone can't be too careful. The moon was full that night and the sky clear, there was sufficient light to make a general reconnaissance, and it was then that I noticed the oval object, which later proved to be a kind of space craft. I started to walk toward the object, but I felt (a physical feeling, this time) something near my leg, and when I looked down, I saw three very small beings. I could not determine immediately what they looked like except in terms of general outline, since they were entirely enveloped in some singularly strange attire, but I could see that none of them was more than twelve inches tall. I spoke aloud, demanding to

know who they were and what they wanted (I am not used to being touched on my nether limbs and I confess I was somewhat offended) but received no reply. I studied them without any fear, feeling that any further untoward action could be dealt with by a firm spanking; a tendency to think of them as children, owing to their size, persisted.

They were looking at me with what I presume was curiosity, I spoke aloud again, and again received no response. I began to think about that and realized that indeed I was drawing no response whatsoever, and I was reminded of several occasions at my classes in the West Boston School for the Deaf when I had seen a normal person speak to one of the students. I concluded that these small beings were unable to hear me (at the time, I assumed it was due to the strange headgear they all wore), and on an impulse, I tried sign language. It is fortunate that the sign language I have learned is conceptual rather than language oriented (on a fairly recent visit to Spain, I was able to inquire directions of a native in Madrid, though I know no Spanish and he stated he was not familiar with English). Instantly, the small being to whom I'd addressed my question responded, and with only occasional confusions, we were able to communicate quite nicely.

Since it was growing cool, I invited them back to my home and after some hesitation (they indicated they wished to check certain instruments first), they accepted and when we got inside the house, they removed their strange headgear and I was able to see their faces. They were quite similar to our own (on a smaller scale, of course), except for their mouths and the fact that they had no ears at all. I have given considerable thought to the matter and

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it is my belief that they are incapable of hearing (I mean that is a racial characteristic), and that their communications are entirely by sign. The mouth appeared to have no function other than ingesting food. I offered them a light collation and they accepted, seemingly quite intrigued by the tea I served. I am most particular about my tea.

I inquired where they had come from and they indicated some point quite distant in the heavens, but I was not able to ascertain the precise location of their home, though I have no doubt they were telling the truth. I also asked them why they had chosen to come here and after a period of considerable confusion, they indicated that they desired to make contact with other races and to join the Galactic Federation.

It was at this point that I began to perceive that they considered me a person of considerable importance, not to say authority. After some reflection, I was able to comprehend how this notion came to occur to them. They had clearly weighed the difficulties of establishing communications with aliens who had not the slightest knowledge of their language. It was a subject I had never considered, but I can see that it would pose decided problems for even the most advanced linguist, since even the roots would be entirely unfamiliar. The

fact that I was able to instantly perceive their meanings (possibly coupled with my advanced years) convinced them that I was a person of extremely advanced intelligence and they leaped to the unwarranted conclusion that, under the circumstances, I must also be in a position to render a decision on their request.

I have always been noted for my honesty, and I want to make it perfectly clear that I did everything in my power to dissuade them from this error, but the conviction persisted despite my efforts, and the conversation reverted to the question of entry into the Galactic Federation. I attempted to explain that I knew of no such organization, but again, they refused to be persuaded. They stated that they had an extensive body of literature all of which indicated that advanced races formed such a union at the earliest possible time, and they spent a considerable length of time telling me of the achievements of their culture (which I admit sounded formidable) and outlining their qualifications for admission.

Well, to make a long story short, it was then approaching dawn and I was weary of the whole dispute. I urgently desired sleep and, charming though my visitors had been, I wanted to be rid of them. One cannot, however, be rude to guests, and the only way I could think of

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to induce them to leave was to admit them to the Galactic Federation, which is what I did. They inquired when the next meeting would be, and I told them in a year; I assumed they would have forgotten the whole silly thing by that time. They asked if they would be notified of the meeting and when I told them they would, they seemed satisfied and took their departure a short time later.

I had forgotten all about the encounter and I had not mentioned it to anyone (one does not go about telling one's business to strangers), but this morning I received a short communication inquiring about the notification of the next meeting and expressing the intention of coming here for it. It seems that several hundred of them plan to attend.

I shall have to organize some sort of meeting for them and I really don't have enough chairs or cake forks, so you can appreciate that it would be very awkward.

Thank you in advance for your prompt reply.

Sincerely yours,  
(Miss) Amanda Porterfield  
Putney Falls, Vermont

Dear Miss Porterfield:

Try some of those plastic forks they make for picnics. I don't think those guys will know the difference.

# On The Tenth Of Apollo 11

Hal Clement, Poul Anderson,  
Frank Herbert, Frederik Pohl,  
Clifford D. Simak, J.E. Pournelle

*Apollo 11 astronauts Neil Armstrong, Michael Collins, and Edwin E. Aldrin, Jr. look from the window of their mobile quarantine unit on board the U.S.S. Hornet.*  
*Inset: Hal Clement.*



Photo Credit: Charles Ryan

## HAL CLEMENT

**O**VER TWENTY years ago, humanity's Space Age began when a tiny sphere reached orbital velocity. The event startled even those of us who felt intellectually certain that it must be coming; somehow, there remains in many human minds a sharp difference between "knowing" and "believing." I had already been a science fiction fan for a quarter of a century; I was firmly convinced of the feasibility and the necessity of such science fiction dreams as space travel and "atomic" energy; but I did feel a strange sensation as I watched Sputnik arc slowly across the sky or flash abruptly across my telescope field. Could it really be happening?

Others reacted even more emotionally. There was genuine panic among

some who had been blandly certain that the United States represented Earth's most technologically competent culture. As usual when people panic they looked for someone to blame; and as a teacher I suppose I should be thankful that the official reaction was to spend more money on science education rather than take the science teachers out and lynch us. The various committee curricula which grew from all this did do some good, though I still doubt that there is any real substitute for a teacher who knows and loves his or her subject.

Other reactions were less useful and, by my standards, less civilized. There was one individual who wrote a letter to the newspapers insisting that we should shoot Sputnik down. I didn't know whether to be more embarrassed by the fact that a product of American culture should want to do such a thing, or the fact that a product of American

education didn't know that we lacked the ability to do it.

There were, happily, serious thinkers about the meaning of space conquest itself. The local educational television station, WGBH, promptly arranged a series of interviews with various professionals to discuss the implications. There was Donald Menzel for astronomy; Giorgio di Santillana, the historian; Isaac Asimov for—should we call it philosophy?—and several others. I did the interviewing, not very professionally as I now realize from the tapes (sound ones only). It was my first television appearance (videotape had not yet been developed) and we went on the air live and without any real rehearsal. I was just a bit tense, I must admit.

For all these various initial reactions, the important part is that the Space Age did keep going. We—when I use this word I mean the human species, not any

On the Tenth of Apollo 11



particular culture or social group—kept it going. That is one of the most encouraging things about humanity which my personal experience recalls. Yes, there was a Space Race, and the contest for the reputation of being first to reach the moon has been belittled as mere political competition. Fine. So be it. We are a competitive species, as a natural and predictable result of our history and prehistory. Individuals compete, for monetary reward and reputation. Cultures compete—sadly, they compete for Earth's resources and, even more sadly, for the satisfaction of that grim human urge to be able to tell the other fellow what to do and/or to make him admit how right we are.

But this shouldn't be allowed to give all competition a bad name. I see nothing wrong in individual or cultural competition in demonstrations of competence, either athletic or intellectual.

Hal Clement

Science and technology are now necessities for human survival. (My prejudices show here. I do not regard "survival" as including a historyless creature with no understanding of the universe and no interest but securing its next meal and gratifying its various other appetites. I do not regard such a being as human in any meaningful sense.) Competition in technological competence and basic scientific knowledge is a legitimate human activity, and there are many worse ways in which differing cultures have tried to show their powers.

Some people feel, of course, that the technical culture is intrinsically evil and that humanity should go back to "nature". The kindest thing about this viewpoint is that it is at least two hundred years too late to be practical. The development of heat engines gave us the choice range from supporting an

exponentially increasing population at the eighteenth century living standard to supporting an eighteenth century population at an exponentially increasing living standard. Being human, we tried to embrace the whole spectrum and are now firmly hooked on a high-energy technology. The withdrawal symptoms would include the deaths, by starvation and fighting over remnants, of at least nine tenths of the human species (that's an estimate rather than a calculation, but I consider it a conservative one).

So I highly approve of the Space Race as an example of essential basic research. I was delighted when my culture was ahead, and am rather unhappy as I watch us drop behind. Basic research is the effort to add to human knowledge, and it seems perfectly clear that we do not now have enough knowledge to keep four billion

GALILEO 11

people alive on this planet more than a few decades. We (reminder: we still means all humanity) need the resources Earth and its surroundings can furnish, both in materials and energy (though of course with enough of the latter we can isolate or synthesize all we need of the former). The culture which first really solves this resource problem will not have to conquer the earth; its members will inherit the place.

I am therefore unhappy at the disappointed and pessimistic tone shown in so many of these articles, written by friends and colleagues of mine to commemorate the tenth anniversary of man's first moon landing. I am unhappy because the pessimism seems justified. Space isn't wonderful any more, and we'd rather spend money on *Halloween*.

Oh, we haven't quit completely. We're still learning things from space. As I write this, Voyager I is heading for Saturn after delivering some millions of bits of information from the Jovian system. Some pretty pictures of Jovian weather and Ionian volcanoes got into the newspapers, which to me indicate that some really critical information about the origin of the Solar System has probably been secured; but baseball spring training is getting a lot more coverage, and the origin of the Solar System gets a resounding "So what?" from a large fraction—a majority, I fear—of the population.

But it's a long way from "So what?" If you are not impressed by the human psychological need to know (and to be sure you're right!), remember that detailed knowledge of the way Earth and its fellow planets were formed is the only thing likely to give a real grasp of what resources actually exist within our reach, and where and how we may be able to get hold of them.

As it happens, I was born into a culture which has never allowed me to go hungry, even when my father lost his job and bank account about 1930. I realize that many have been less lucky, and that our distribution of the necessities of life needs a bit of polishing. However, the most perfect distribution method of the most ideal social order will not mean a thing if there's nothing to distribute. If our technology, with its constant need for energy and raw materials, should actually fail, there'll be only one job left for both the theoretical and practical politicians.

That will be to find a universally satisfactory method of deciding which nine out of ten people die. I doubt that they can do this, so let's keep basic research in general and space activity in particular at a nice, high priority. I'd like to be able to get a more optimistic set of articles ten years from now.

Photo Credit: NASA



Photo Credit: Richard Todd

J.E. POURNELLE, Ph.D.



HERE WERE you on July 20, 1969? For most dates that would be a silly question; but I doubt there are many on this planet, and certainly few science fiction readers, who cannot answer for that particular day; who cannot merely remember where they were, but recall

the feeling, "Tranquility Base here. The Eagle has landed."

That should have been the most significant moment in the history of Man; more significant than the invention of the wheel, the development of agriculture, the harnessing of fire or the domestication of animals. It should have been the first second of a new era.

It has not been. But it could be yet.

For no larger portion of the national budget than was spent—well spent—on the Panama Canal we could put an energy floor under the world: assure that no free nation would ever be without a basic minimum of safe, clean energy. We would at the same time make it extremely unlikely that any single accident or disaster—including Lucifer's Hammer—could exterminate the human race.

On the Tenth of Apollo 11



*Earthrise on the moon, a sight which greeted the Apollo 11 astronauts as they completed their lunar orbit insertion burn. The planet is 240,000 miles away.*

construct all of the above. Every one of the scenarios begins with the Moon.

The Apollo expeditions made an amazing discovery: over 90% of everything we'd need for space industries, power satellites, habitats, ships, asteroid mines, and all the other dreams of the science fiction writers is found in industrial quantities on the Moon. More than simply found there: the minerals literally lie there as a fine powder (the best model of the Lunar surface is not rocks but face powder) ready to be scooped up with an ordinary back-hoe (fitted with oxygen tanks, of course; but there's plenty of oxygen in Moon rock) and refined using plentiful solar power.

The mass-driver, an electronic sled that accelerates cargo to high velocities, has been with us in science fiction for a long time. It's no longer science fiction. Gerard K. O'Neill has built a working model, and the linear motor is studied by transportation-system designers. Building a sun-powered mass driver that would take the lunar rock scooped up by our back-hoe and shove it into a lunar orbit wouldn't be duck soup, but it is certainly not beyond our present capabilities.

From lunar orbit it takes almost no energy to move the rock into various other useful orbits: Low Earth Orbit (LEO) for the industrial satellites, Geosynchronous Earth Orbit (GEO) for the power satellites, various other orbits for the habitats.

There are a number of other benefits. Given the Moon Base and the mass-driver we'd be able to do space science on weekends. For trivial additional costs we could put up an orbital telescope; one that could not only see Earth-sized planets at Alpha Centauri distances, but let us study the cloud patterns on them.

We could go to the asteroids, where there's more than enough metal to supply the world with riches. We could study the planets and understand the history of the solar system; which is not trivial knowledge, because without a better understanding of the history of solar output we can't really be sure what triggers Ice Ages.

With massive space capabilities we'd be able to make adjustments in Earth's climate—and that's no arrogance, nor is it some monstrous idea of technology gone mad. We've already modified

We could take the next step in Man's destiny: move from "Only One Earth" to our rightful place among the planets; and we could do it in this generation. Indeed, we may have to do it in this generation. We have the resources, the technology, and the freedom; the next generation may not. It is more than just possible that this generation will make the most crucial decision in Man's history.

There are a number of scenarios for the exploitation of space: Solar Power Satellites, which generate electrical power in space and beam it down by micro-waves or lasers; SOLARES, which employ large mirrors to beam down sunlight which is converted to useful energy on the ground; large-scale industries in space; "O'Neill Colonies," space habitats which would probably

Hal Clement/J.E. Pournelle

Earth's climate in totally unpredictable ways. In a generation we've released to the atmosphere millions of tons of carbon—carbon that it took nature a million years to store away as coal and oil. The effect of the released carbon dioxide is not known, although it's fairly certain it has a warming influence. We've also released a great deal of particulate matter, which makes the atmosphere brighter, and thus has a cooling influence. The two may cancel each other out. They may not. We don't know. But if we take our energy from space, we'll know whether we're adding total heat to Earth or not, because we'll know whether the sunlight we made the energy from would have come to Earth or not.

And with further study of the planets we'll understand the weather machine well enough to know whether Earth needs more or less heat. After all, nature is not inherently benign. Most species that ever existed are extinct. "Natural" does not necessarily mean beneficial to what exists—man, American Eagle, condor, or pelican. "Natural" in general means uncontrollable.

What would a new Ice Age do to the snail darter and the burfish lousewart?

If we are concerned about the Earth, then let us put the messy operations—mines, energy plants, slag heaps—into space and make as much of Earth as we care to into a park. We can do that; we don't even need new scientific breakthroughs.

Exploitation of space is a reasonable national goal. Right now, in 1979, we know more about how to establish a permanent base on the Moon than we knew about simply getting there in 1961 when John F. Kennedy won his permanent place in man's history.

Exploitation of space is not merely a reasonable goal; it is a necessary one. There are a number of faults with the Jay Forrester models of doom (the MIT world simulation studies which inspired the book *The Limits To Growth*); but it is plain to me that if we are forever confined to Only One Earth we are inevitably doomed to extinction; only the timetable is debatable.

The Panama Canal cost about 5% of our national budget. It benefitted many peoples and nations.

For the same costs we could change history and benefit all future generations forever.

What better goal to set ourselves on this, the tenth anniversary of what should be a new era?



Photo Credit: Brian Fraser

### FREDERIK POHL

**T**HE LUNAR landing of a decade ago was a colossal triumph for the human race. Like everyone, I wept and cheered. A new day was dawning, and the occasion deserved a lot of celebrating, and got it. About its tenth anniversary I am not so sure. It is a little like celebrating Lincoln's birthday. He was a great man, but he isn't around any more. The manned space program isn't quite dead, but it is certainly far from robust right now; something has gone wrong, and looking back to that immense promise produces almost as much sadness as joy.

I think now that we went about it in the wrong way, but that was not as easy to see ten years ago. President John

Fitzgerald Kennedy was a complicated man, and when he decreed that there should be an American on the Moon before the end of the 1960s I am sure his motives were mixed. Part was politics. Another part was personal vanity. No matter. I think there remained a third part—and, I think, a larger and more serious one—that saw space as the sea we should sail on, and that recognized that knowledge was worth acquiring, even if we had to build Buck Rogers rocket ships to go looking for it. *Real* knowledge. Abstract scientific knowledge. Knowledge of the kind that people like Senator William Proxmire deplore: knowledge which does not make the Russians look inferior, or give us megatonnage to throw at the Chinese, but becomes another increment in the store of human wisdom and



Photo Credit: NASA

thus enriches everyone alike.

Well, it didn't work out all that pure. The mixed motives influenced the events. Kennedy took the dream and turned it into a national goal. He passed the goal on to the federal bureaucracy, and they transmuted it into a government project. What is a government project? It is a machinery of state that is required to serve four separate ends: power; patronage; publicity; and...oh, yes, whatever the damn thing was supposed to be about in the first place.

As government projects are scored, Apollo batted at least .750 because it was an immense success in three out of its four objectives. When the power flowed into Lyndon Johnson's hands, he used the patronage to make Texas green. And from Day One on there was a ceaseless *rumpety-tum* of publicity drums. Astronauts became stainless saints. Commentators became folk heroes. Politicians became demigods. And the tangible, specific objective of the project—the moonwalk—was achieved.

But then the programming ran out. The trouble with programs that are structured toward goals is that they don't know what to do next. The landing became a super circus spectacle, and then it was over. Another landing? All right. But the TV ratings dropped. Different kinds of missions? Well, yes, a few now and then, but the launches weren't making Page One any more. The steam was gone. The bureaucracy had been organized to sell circuses. It didn't know how to go about selling knowledge.

But in the long run, knowledge is the only sure reason there is for hurling someone, or something, off the surface of the Earth. Knowledge does not deprecate, it harms nothing in the environment, and it has the miraculous trait that each new piece of it you collect makes all the other pieces you already have more valuable.

It is true that knowledge sometimes has a dollar value—even a survival value. We have all been oversold on the dollar value: the improved weather forecasts, the pacemakers, the Teflon frying pans that are all supposed to have come out of the space program. We may not have heard enough about the survival value.

I am not talking about the military applications of space research. They are real enough, but, as there is plenty of capacity in the world today to kill everyone in it several times over, it does not seem really worth much effort to

add more overkill. What I am talking about is the survival of life on the Earth—of humans, mostly, but indeed of everything alive. Any science fiction writer can whip up a dozen scenarios of wandering asteroids or comets threatening to demolish the Earth—a good many writers have already done so. Although the chances of that happening at any particular time are remote, over time they are quite real, and a flexible, operational manned space capacity would give us about the only chance of survival in the face of such a threat. Does that seem too remote to be convincing? Then consider the very real Van Allen belts. They are our first line of defense against lethal solar radiation, and they are vulnerable. They were bent badly by one of our nuclear-bomb experiments a decade or so ago. They could even be destroyed, if we were not careful to protect them. Obviously it is worth our while to keep them screening out dangerous radiation. Without the pure knowledge gained from the space program we would have no way to do that, because we wouldn't even know they were there.

But the ultimate value of knowledge is not to be quantified in terms of tangibles, any more than the value of beauty is. Or of life itself. It is its own reward. We want it not for the good it will do us, but because it is good to have.

All the same—

All the same, space is good business—provided we define "business" in a large enough context.

I doubt very much that there is going to be a space Rockefeller or Ford. It costs a lot to buy chips in this game, and the would-be millionaires aren't anxious to make the investments required. Actually, they think they have found a better way. Talk to any of the people who are bursting to see private enterprise in space. Ask them if they want private entrepreneurs and they will shout "Yes!" Then ask them if they are willing to go ahead without government subsidy and they will look at you as though you were insane. There may well be some new millionaires coming from space-related projects, but the place the millions will come from is right here on the ground, in the good old United States treasury. As in all government-private partnerships, the profits will be private, but the risk capital will come from you and me.

The justification for this sort of enterprise is the same as the justification for the railroad-looters and land-grabbers

of the 19th century. Looked at objectively, it seems immoral. It is certainly unjust. But in the large frame of reference the space program means wealth of some kind for everyone, and it may not be very important how that wealth is divided; the end may justify the means.

So Gerard O'Neill's "LS" project is good business for the human race. It has everything going for it: (1) a stepping-stone for exploration of other stars; (2) an insurance policy for the human race, so that if we kill ourselves off on Earth at least there may be a chance for species survival elsewhere; (3) an amelioration (even if a slight one) of population pressure; and (4) even a fairly quick (but, I think, a fairly short-lived) dollar payoff by generating and microwaving energy to sell to Earth.

CETI, the attempt to communicate with aliens, strikes me as a good investment, too, although on somewhat different grounds. CETI is a real lottery ticket. The odds against a win are immense. But what a potential payoff! And the price is right. You could finance all the CETI research anyone would want for what it costs to build one Superdome.

And, finally, I am whole-heartedly in favor of manned space travel to anywhere, as often as possible, and the hell with the cost. I don't enjoy paying taxes any more than you do, but this is one portion of my annual bloodletting to Uncle Sam that produces far more pleasure than pain. A manned mission to Mars, for instance, would not be cheap—a cost somewhere between, say, a new aircraft carrier and a B-1 bomber program. It is a source of shame and incredulity to me that there are powerful forces urging either of the latter alternatives on us, while there does not seem to be one single public voice calling for the former.

It seems to me that now, ten years after the first lunar landing, there has been a considerable disenchantment with the manned space program and with space exploration in general. The tarnish comes from sources that are easy to identify—publicity oversell; false claims; pork-barrel exploitation and a lot more. But the potential of space isn't a campaign promise. It is a reality. John Kennedy was right. Space is the sea on which we must sail. And Julius Caesar was right, too. On this full sea we are now afloat, and we must take the current when it serves or lose our ventures.



Photo Credit: Charles Ryan

### FRANK HERBERT

**M**EASURED AGAINST what is about to happen, the Apollo Modules are our horse-and-buggy in space—primitive, but a reality of our time which will open the door on a very different tomorrow.

If you ask "Should we be in space?" you ask a nonsense question.

We are in space.

We will be in space.

Mankind will become a creature of space.

About the only thing which could prevent this would be the total destruction of Earth, at present our only space platform. But our inexorable movement into space changes even that problem. The political reality of a humankind dispersed throughout the Solar System presents a far different picture from that which we face as I write this—all of our eggs are in one basket. No politico-economic system now being practiced on Earth can evade awareness of that fact—not if the proponents of that politico-economic system wish their system to survive.

Which begs the question of communism versus capitalism.

Neither system will survive as we know it in space. Communism, which creates an all-powerful bureaucratic aristocracy, cannot survive without high walls around its population. There are no walls in space. Managed capitalism (which is really what we are talking about in the United States) cannot survive unless it controls the lines of energy and materials. No such controls are possible in space.

What we will see can be compared to what mankind faced on hostile frontiers throughout history: a kind of cooperation-by-necessity, an inescapable mutual interdependence for survival. You

help your neighbor raise his barn because tomorrow you may need his help.

Our situation at present displays many similarities to conditions faced at the beginning of the Steam Age. The questions and the pronouncements of that historical period give you a sense of *déjà vu*.

"If God had intended man to go sixty miles an hour . . ."

"The destruction of the family by these insensate machines cannot be tolerated!" (A Welsh minister in 1841.)

"The displacement of population brought about by these unholly devices are such as no civilized people can permit." (A speech in the British Commons, 1838.)

The real questions of those times were, as they are today, ones of politics and economics and of science and engineering. The questions of politics and economics are always addressed after the fact. Science and engineering go about their business much like a force of nature.

With hindsight, these are the things we know today about the Steam Age: Steam allowed us to do things we could not do before—such as pumping water from deep mines, milling hard metals and moving heavy objects rapidly over long distances or short ones.

Steam also raised enormous political and economic issues which have not yet been resolved because we moved from steam into other energies which did much the same things but with more sophistication.

Reading the history of those times you can see the currents of these times. Many new people rose to positions of great power. Old power centers either adapted to the new conditions or they dissolved. Tremendous leverage gravitated to those who could employ creative imagination to control the new knowledge.

The political issues inherent in this are obvious. The forces of conservatism (which in this sense really defines the status quo) will fight to maintain their present privileges—even if this means delaying our movement into space. In this arena of "pure-power politics" there is no escaping the fact that whoever controls space controls Earth. But the control of the space around Earth does not carry with it control of space beyond such a sphere. That is too simplistic a viewpoint. The movement outward will continue because it represents also a movement of escape

from restrictions—no matter how you define restrictions.

What then can we predict about the aftermath of the Apollo Eleven landing and our other tentative outreaches into the airless void which surrounds our lonely space platform?

In the field of politics: (1) People will move beyond the immediate control of any central government just as they did in the westward migrations across the American plains, and the northwestward migrations of the Germanic tribes into what are now Norway, Sweden, and Denmark. (2) Some of these migrations into space will never be brought back into a central fold. (3) Just as those Germanic tribes set a pattern for individual freedom and representative government which helped to shape the British (and thus the U.S.) systems, the new migrations will once again re-form social and governmental structures.

In the field of economics (which can never be separated from politics): (1) New products will appear just because they can be manufactured only in the high vacuum of space. (2) Familiar products will be manufactured in space at less cost and higher quality because of available abundant energy and the vacuum. This is especially true in electronics, metallurgy, and precision milling of metals. (3) Cheaper energy in space will open enormous new areas for human habitation—although there still is some question whether electrical energy generated in space can be transmitted back to Earth without unacceptable damage to the planet's atmospheric shielding.

In the fields of medicine and genetics: (1) Cheap cryogenic storage of whole people and "spare parts" will make profound changes in attitudes toward life and survival. (2) Many medicines will be manufactured more cheaply and be of higher quality in space because of easily available sterile conditions and isolation facilities. (3) Experiments with dangerous disease cultures will occur in safe isolation and, therefore, will become more common, leading to new achievements in disease control. (4) Exposure of human reproductive cells to the heavier radiation loads of space will ignite a much greater mutation rate—most of which will be lethal or sterile. *But* those who survive with improved space adaptation characteristics will insure a wide divergence from what we now consider to be the human norm. Our descendants in space may look nothing at all like Earthbound

On the Tenth of Apollo 11

humans.

At this moment, there is really no such thing as a space industry in terms of what we can expect to see by the year 2000. As the economic advantages of this outward movement become clearer to existing industry, and as new inventions spread the base of "who can operate in space," that outward movement will become explosive. Then we will see a true space industry.

Finally, something should be said about pure science. There is no doubt that off-planet scientific observations will add enormously to our store of practical knowledge; every advance of pure science in the past has had this effect. We can only guess at some of the consequences.

But there will be new materials made possible because of what we learn in

space. And a more sophisticated understanding of astronomy and other spacial relationships may generate new ways of moving humans and/or materials across the void.

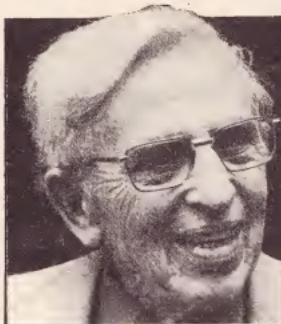


Photo Credit: Jay K. Klein

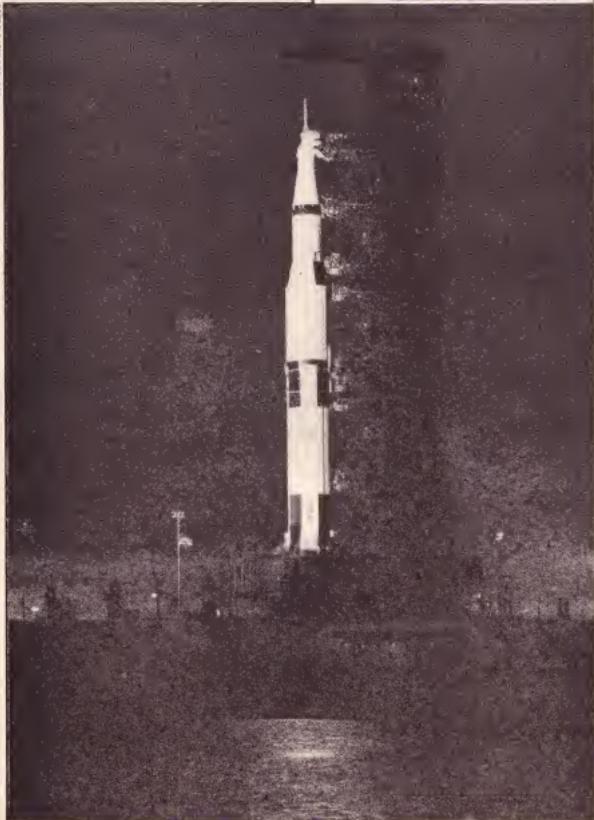
## CLIFFORD D. SIMAK

EN YEARS is too short a time in which to make a valid judgment on the importance of the manned Moon landings. By the middle of the next century historians will have passed judgment on their significance. This judgment will be based upon the impact that the landings will by then have made upon world history. If, by that time, no noticeable results have stemmed from the landings the entire achievement probably will be written off as a splendid example of American technology that, because of social and economic factors, had not been followed up.

It is to be hoped, of course, that this will not be the case. While we are still too close to the event at the moment to do more than guess at what will come about in space, we can be allowed that guess. My own personal guess, perhaps more hopeful than can be justified by present developments, is that by the end of the next millennium, in the year 2979, the Moon landings may be the only event of the 20th century that will be accorded more than passing notice. There may be, I realize, possibly a couple of other events that may be remembered as well from our century—the quantum theory and the advent of nuclear fission. But if so, they probably will be placed secondary to the Moon landings.

One thing that we should realize about the Moon landings is that they came about because of a special set of circumstances. Placing men on the Moon in 1969 was as much a political achievement as a scientific and technological triumph. Eight years earlier, in May, 1961, President John Kennedy had announced that the United States would land a man on the Moon and return him safely before the end of the decade. This was America's trump card in the space race that had started in 1957 with the Soviet Union's launching of its first sputnik. The space race was an emotional and political phenomenon that might be equated in some aspects with the Crusades of the Middle Ages—a time when entire peoples are caught up and swept along by an idea that, viewed in retrospect, may seem vaguely illogical. Had it not been for the space

Photo Credit: NASA



Frank Herbert/Clifford D. Simak

The Saturn V/Apollo 11 combination weighed 12.6 million pounds and stood 363 feet high.

race we might not as yet have placed a man upon the Moon.

The space race now is history and at the moment we have no overwhelming political, emotional, or social motive to develop space. I would judge that present public opinion in the United States is solidly against the cost of further space exploits. After many exhausting years in which our streets were filled with protesters and advocates, it would seem to me that the Day of the Cause is gone. We have had our time of public enthusiasms (either for or against) and now want to settle back to enjoy some peace and quiet, if the world will only let us. If all this is true, we cannot count, for some foreseeable distance into the future, on any public support for an adequate space program.

There are some of us who do not share this attitude, but our numbers are few. It is my conviction that when Neil Armstrong first set foot upon the Moon he became a pioneer in the most classical sense, that the landing on the Moon signaled a new frontier for humankind. I have a gut feeling that our destiny lies in space, that the years we spent on Earth were only a training exercise to prepare us to go into the galaxy and the universe. I sometimes tell myself that the basic purpose of our special kind of intelligence was to evolve a species that could go into space and seek out the mysteries there.

In the face of general public apathy we have not done so badly since the Moon landings. We have viewed Mercury at close range. We have had a long look at Venus, the Soviets landing a probe on the planet's surface, gathering almost an hour of surface data. Instrumented probes have been landed on the surface of Mars. We have looked on the face of Jupiter at only a small distance and soon will be doing the same with Saturn and, perhaps, Uranus. A few years from now the first spaceship from Earth will head out into intergalactic darkness beyond the solar system, carrying a message from us to whatever hypothetical intelligence that in unguessed millenia may come upon it.

These are no small achievements, but to the great mass of humanity they mean little. While it is true that basic knowledge such as is gathered by the present explorations of the solar system may be priceless in the long run, this is an argument that has little public impact. The public objections to space travel are painfully well known to all of

us. It costs too much; think of all the good we could do for the needy or for education or for a number of other things if the money were spent in those areas rather than in space. We are not going to get anything out of space; there is nothing there we need or want. Maybe it is all right, but now is not the time for it; we should wait until we have beaten inflation and worked out the unemployment situation and solved some of the other troublesome problems that plague us.

These viewpoints can be answered, but it's a waste of breath to try. And if you don't believe they are there, ask the next ten people who come walking down the street.

There is no question that after a good start we have made little progress in moving into space. We have carried out our program for visiting the planets and the results of these explorations, in years to come, may loom much larger than they do now. We have launched satellites that are performing many useful tasks. But there has been little more than some brave talk about establishing orbiting bases or setting up bases on the Moon. Worst of all, there are some barely-heard murmurs concerning the use of orbiting lasers as military weapons.

There is, however, one area of hope to which we have not turned; in a little time and with some work in the right direction it might be a good hope.

Would it be possible to enlist the managerial skills and resources of business interests in the opening of space? After all, once space is open it will be the business interests that will benefit the most; there seems no reason that they should not be invited to participate in the developmental work that will enable us to go there. I am thinking not only of American interests, but of worldwide interests. Multinational companies and large conglomerates are captained by hard-headed businessmen who should not be adverse to venturing long-range capital if they can be shown some advantages in orbiting industrial plants or other business possibilities in space, or in installations on the Moon. First, however, such possibilities must be envisioned. Any science fiction writer can reel off half a dozen such possibilities without pausing for breath, but simply naming them is not enough; some solid, convincing evidence that the advantages do exist must be developed.

So far our space explorations have



Photo Credit: NASA

been aimed at the uncovering of clues that might help in solving some questions that scientists have been asking for years. Could the Moon, we wondered, give us some clue to the age of Earth? Why are the Earth and Venus such different planets? Did Mars ever have a more extensive atmosphere and plentiful water and, if so, what happened?

All good questions, valid and with a need to be answered, but there is nothing in them that would motivate an international consortium of business interests to gamble a dollar on the chance that there might be some economic sense in going into space.

Maybe it is time we turned loose some imaginative research engineers, with whatever support they might need, to have a close look at how space can

*Where there is no vision, the people perish...*  
Proverbs, xxix. 18



Mission commander Neil Armstrong took this photo of astronaut Edwin E. Aldrin, Jr., as he climbed from the Lunar Module to the surface of the moon.

Photo Credit: Charles Rydin

best be used. As an example, would it make sense to put a team of such investigators on the Moon—not for only a few days, but, say, for 90 days, longer if necessary? And when I say turned loose, I mean turned loose, going there with unlimited freedom to investigate what the Moon might have to offer and how we could go about using what it had to offer.

No scientist and even less an engineer, I have not the slightest idea of what might be involved in putting a team on the Moon for 90 days or longer. But if we are going into space at all, these are the kind of problems that we have to solve and the sooner we begin the sooner we'll have answers. If we were to seek data that would bring business interests into the management and financing of space development, it



Clifford D. Simak/Poul Anderson

**T**EN YEARS beyond that day when the Eagle landed, we live in the ruins of our own triumph. The regaining of what we then had and the going on to new victories will be slow, hard, costly—far more than needful, had we but persevered at the time—if, indeed, these possibilities remain open to us at all. Whether they do or not is a question of how strong is our will, as a people, to survive.

The accomplishments of Apollo and the subsequent faltering of the American space effort cannot be understood in isolation. They have been integral with the entire history of our era. What Apollo (and, later, Skylab) did that really mattered was to prove that humans can make other worlds and the deeps between them their own. Also, from our early undertakings we got the foundations of a capability of continuing toward the stars, more strongly and easily with every step: much as ancient lungfish struggling along a Devonian strand laid the foundation on which nature built birds and men. We learned that the cost isn't very great; at the height, it amounted to one percent of our gross national product. Therefore, if we are now flagging—for a single example, look at how the space shuttle program has been cut back—this isn't because of technical difficulties, but because we lack the desire, the energy.

Meanwhile the Soviets proceed methodically with the development of permanent manned stations in Earth orbit, from which in due course they will be readily able to explore and exploit the whole Solar System. As Robert Heinlein has remarked, once you're that far aloft, you're halfway to anywhere.

Now it may well be, as many distinguished authorities have claimed, that this gradual advance was always a better idea than an ambitious vault straight to the Moon. Alternatively, it may well be that Arthur C. Clarke and others are right, when they maintain optimistically that we were bound to retrench and perfect our close-to-home instrumentalities, before we could return to the Moon, and go on to the planets, in force. The best course to follow is a matter for the technologists to decide.

But the goal of that course must be

set by society as a whole. I think of years of bloody shilly-shallying abroad, I think of an official plan for meeting the coming energy shortage which scarcely mentions research, I think of national paralysis almost everywhere, and it seems not surprising that we have no real, long-range objectives in space any more.

Yet maybe America can be awakened and her eyes turned skyward again. Lest this hope appear chauvinistic, let me add that we, as the wealthiest and most productive nation on Earth, have a special obligation toward all mankind, and that we can hardly discharge it more benignly, with fewer harmful side effects, than by helping to open up the cosmos.

What, then, can those of us who believe this is true do in a practical way to revive the dream of Apollo? What realistic, attainable objective should we advocate for the near future? I can only offer a few suggestions.

First, we need to convince enough people that the exploration and colonization of space are worthwhile, even vital endeavors. We cannot expect hard-pressed taxpayers to underwrite our mere private enthusiasms. They have every right to know what the costs and the benefits to the common weal will be. In this regard, NASA failed dismally, and that is no doubt one cause of our present trouble. With a few honorable exceptions, it left its public relations in the hands of flacks, and of course everybody saw through the slick, dephileless images which those put forth.

I won't go so far as to say that science fiction writers should have been hired, though perhaps that is not an altogether bad notion. Certainly, however, an honest attempt should have been made to educate the public in the real significance of the space venture. This could well have been part and parcel of a general program to raise the level of popular understanding of science and technology, a highly desirable thing in itself. Today, at last, various organizations, notably the National Space Institute, are making efforts in this direction. Those efforts ought to be encouraged and strengthened.

Let me respectfully propose to NASA and NSI that they scrap that ill-omened phrase "spin-off." This has always suggested developments, many of them trivial, which could have been made directly at far less cost than sending men to the Moon. Would it not be wiser to discuss entire kingdoms of advances,

from heart monitors and improved ceramics to new management techniques and basic scientific knowledge, which have been the inevitable results of a great, integrated effort? Such discussions do get published, but they need to reach a much wider audience, and so far they are not doing so. The label may be part of the problem.

Besides the populace, we have to reach the decision-makers—top industrialists, politicians, military and scientific chiefs, administrators, potential investors, even writers and artists. We have to convince them that there is a profit to be made out yonder.

"Profit" is a dirty word in some circles. However, all it means is "the return on an investment, over and above what that investment could have earned at prevailing rates of interest," and "prevailing rates of interest" merely expresses what rock-bottom-conventional undertaking will yield. Thus any society, capitalist, socialist, or what have you, must in the long run concern itself with profitability. In the case of aeronautics, we can't keep on forever throwing resources off the Earth; we must start getting something back, and it isn't worth the trouble unless the net gain is substantial.

In my considered opinion, the profit to be made by permanent settlement in space is nothing less than the survival of industrial civilization, and therefore the survival of nearly the entire human race, along with such amenities as peace, freedom, enough to eat, and the chance to reach a high age in good health. We are using up this planet too fast already, and we haven't yet begun to do anything very worthwhile for the underprivileged majority of our species. In space, we have waiting for us limitless resources of raw materials and energy; industrial sites which cannot scarify or pollute our home environment; accomplishments impossible on the ground, e.g., zero-gravity manufacture; and unforeseeable new information about the universe, to enlarge both our powers and our spirits.

A foresighted corporation executive might agree to this, but he is nevertheless responsible to his shareholders, not to their grandchildren. Hence we should encourage private enterprise in space, with the prospect of early rewards. This ought to be popular nowadays, when government is felt increasingly as oppressive and inept. A United Nations resolution requires that everything in space be done under

official auspices; but that need not prevent Washington from offering tax breaks and other inducements, or from standing back out of the way.

Washington could also urge and help friendly foreign governments to create a favorable climate for business in the cosmos. Countries situated on or near the equator are in an especially favored position. The capital they could attract, and the eventual profits coming back, would do far more for them than any amount of foreign aid. The Sabre Foundation has a considerable amount to say about this.

To be sure, we have no magic carpets to take us directly into the void. If we had maintained the magnificent engineering organization of NASA at full strength, we would be further along now than we are going to be, at best, for another decade or more. However, it would still have had to make certain kinds of progress which lie ahead of us. What are these? Again, I have just a few suggestions.

First, we need to work on launch systems. A Saturn Five liftoff was an incomparable, almost religious experience; but there will be no more, nor should there be. It was the sole way to go at the time, but it was simply too wasteful for the long term. The space shuttle represents a marked improvement in principle. Yet the frontier of further development is seemingly boundless. More efficient rockets; chemical-nuclear tandems; magnetic accelerators; laser beams; eventual skyhooks—who knows? The one certainty is that we can do a lot better than now, if we want to.

Second, we need to maintain and increase our efforts with unmanned satellites, probes, landers, vehicles, and robots in general. They are essential pioneers; they are also essential settlers; their cost effectiveness can be incredible. Weather satellites, com-sats, and Landsats alone have repaid the entire expense of the space program, from its inception, several times over. In that connection, we could do a great deal more with computer simulations, once we have enough data to write meaningful programs.

Third, we need intensive research on life support, so that humans can spend years or generations off Earth in health and happiness. Otherwise, few will ever go. Some people state that that isn't necessary anyway, that robots can do everything for us. It is even claimed occasionally that before long artificial

intelligence will be so superior to natural that *Homo sapiens* will have nothing to do but pass on his heritage to his creation and slip gracefully into oblivion.

Now I am all in favor of partnership between man and machine. In fact, we evolved with it. Nevertheless, the operative word is "partnership." Computers have already enhanced our minds in an indirect fashion. In the near future, they may well do so more directly. In the farther future, perhaps it will be entirely normal to become a kind of cyborg when the flesh-and-blood body is wearing out; or we may live side by side with robots of enormous intellect. But I cannot see us ever giving up the *experience* of being human.

Certainly for the rest of this century, and well into the next, no machine will

have half the versatility of a living explorer or worker, nor be half as interesting to those at home who must back up the whole effort. Don't neglect that factor of sheer interest, emotional engagement; it's the power behind most of what we do, from wars to weddings.

Hence we need ways for men, women, ultimately children to be at home elsewhere than on Earth. The sooner we begin serious work on this, the better.

A few lines of research are obvious. (Doubtless many more are less so.) Recycling, the closed ecology—which would be an invaluable guide to proper care of the Terrestrial biosphere. Protection against radiation—possibly through advanced magnetohydrodynamics, which again would be very

useful here on the ground. Effects of high, low, and zero gravity, and how to counteract any that are deleterious—which ought to teach us much about physiology, to the benefit of medicine. Psychological effects—though here we may find that history has anticipated us, in such places as monasteries and caravels.

This has been the barest sketch, utterly inadequate, of what we must do if humankind is to gain a permanent place in the cosmos. None of it is terribly difficult, if only we can summon the will while time remains, while Earth is not yet too impoverished to make the investment. At the beginning, therefore is the necessity of making the people understand the necessity: of giving them the vision.

—G—

Photo Credit: NASA



# Interview: H. L. Gold

Jeffrey Elliot

The following interview is composed of excerpts from an original article by H.L. Gold which appeared in his collection, *What Will They Think of Last?* in conjunction with an interview conducted by Jeffrey Elliot.

Right: H.R. Gold  
Opposite Page: Gold with his wife Nicki.

**W**HEN SCIENCE fiction fans gather to assess the state of the art, few names pop up more often than Horace L. Gold, the founder and former editor of *Galaxy* magazine, and one of the field's premier editorial giants. Indeed, Gold ranks alongside such science fiction legends as John W. Campbell and Anthony Boucher, both of whom have left an indelible imprint on the field for years to come. Like them, too, he first established himself as a top science fiction and fantasy writer, with such classics as "Trouble With Water" and, especially, "None But Lucifer," plus everything from slicks to comics and radio.

**Elliot:** How did you first become interested in science fiction?

**Gold:** Before I tell you how I came to do what I did, I have to tell you how I affected the world from birth on. I was born the year World War I started, graduated the year Roosevelt and Hitler came to power, got married the day World War II began, had a son twenty days after Pearl Harbor, founded *Galaxy* magazine just minutes ahead of the Korean War, got divorced the year of

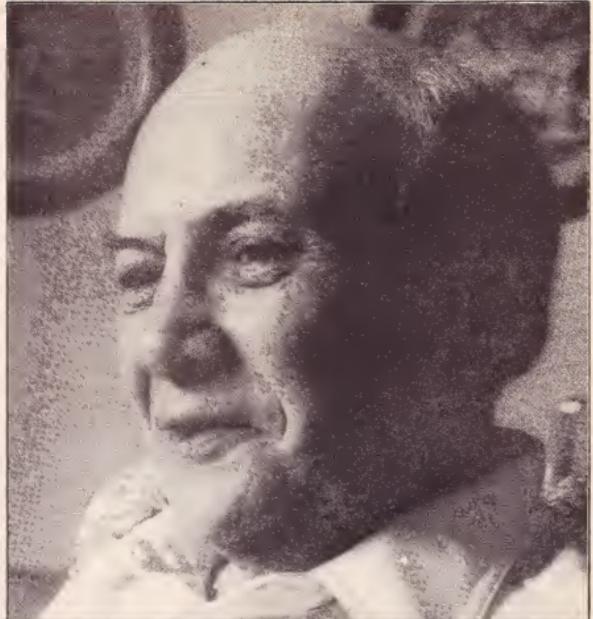


Photo Credit: Richard Todd

Sputnick, and remarried the year of the Gulf of Tonkin Resolution. In other words, I'm an historical Typhoid Mary and should be paid a dollar by every man, woman, and child on Earth—a lousy buck apiece—not to make any major moves any more. As for science fiction, I discovered it when I was thirteen—a magazine with monstrous ants and a spastic man looking up at a girl in a bronze bra and filmy skirt being tenderly held in the mandibles of one of the bugs. It was beautiful, so beautiful that I decided right then to become a science fiction writer.

**Elliot:** How did you prepare yourself to write science fiction?

**Gold:** I studied English and the sciences as hard as I could and wrote stories for the school magazines. After that, I wrote and wrote—thousands and thousands of words that—well, I'd walk to the post office to mail my stories and come back to find a rejection slip waiting for me at home. I never could figure out how the editors did that. Then I started bringing manuscripts to the editors instead of mailing them. I got them back even faster that way. But I persevered—and one day I brought a story to a wonderful old man named T.

O'Conner Sloane. He got dangerously excited about it for a man of eighty-two, but he said it was much too good for *Amazing Stories*. So he took it and me upstairs to the editor of the company's prestigious magazine, the *Delineator*, and demanded that it be read. I got it back when I returned home. I think it arrived before I did. Next month, the *Delineator* folded. I immediately saw the connection, but I wanted to sell that story and brought it back to Dr. Sloane. He maintained it was too good for his magazine and refused to buy it. So I never sold that story because *Amazing* was the only science fiction magazine at that time, and I lost the story somehow.

**Elliot:** Did you receive much encouragement from your parents in pursuing a career as a science fiction writer?

**Gold:** My parents were vociferously against it. How, they wanted to know, could anyone make a living putting black marks on white paper? So I wrote and worked at any job I could find—and there weren't many, because this was at the bottom of the Great Depression. I remember being a bus boy in a fancy place called "Roadside Rest." I was interviewed by three Rumanian brothers

who owned it, and though I didn't know it, I was hired because there was nobody else around. So I worked from ten in the morning to two the next morning—and then had to walk home because the buses stopped running at midnight. It was a seven-mile walk and I was pooped. But I was there at ten the next morning, ready to put in another sixteen-hour day. Did I mention that I worked for the waiters, seven of them, and each gave me a quarter, or a grand total of \$1.75? But the brothers were there already and I was told to come into the office, where they unanimously told me I couldn't work there any more. "But why?" I asked. "Because," they said, "you are a writer, an artist, and we couldn't stand the thought of a writer being a bus boy." "But you're not paying me," I argued. "The waiters are—and besides, I've never sold a story, so how can I be called a writer?" They were Rumanianly adamant, though I begged, pleaded, cajoled. I went home in despair—and found a letter from someone named Desmond Hall awaiting me. It was on Street & Smith stationery—and it said that he was happy to inform me that my latest story had been accepted for *Astounding Stories*!

**Elliot:** How did your parents respond when you informed them of that first sale?

**Gold:** Well, I showed my parents the letter. They were unconvinced. After all, how much could a story bring? The letter didn't say, only that Mr. Hall was cutting 1500 words from it. I told my parents that that brought the wordage to 19,500—and if they paid a cent a word, it would be \$195, or \$97.50 for half a cent. They scoffed. But the check arrived in a week or so—and it was for an astounding \$195! I suddenly became a big man in my family's eyes, a twenty-year-old writer!

**Elliot:** Were you ever concerned, even with that first sale, that you might not be able to make a living by writing science fiction?

**Gold:** After I received the letter, I went to meet Mr. Hall, who immediately put me on a first-name basis, and said he wanted to buy more material from me. So I moved from Far Rockaway, a seashore resort that was mobbed in the summer and abandoned in winter, a dismal place to live, to Greenwich Village, just a ten-minute walk from Street & Smith. It was wonderful! I sold half a dozen stories to Des in pretty short order. He told me, though, it was impossible to make a living writing

science fiction and urged me to diversify. But first, I didn't know how, and second, it was science fiction I wanted to write. Meanwhile, my first story was published and appeared on the stands. More important than my being immortal for a month was that Hitler and Mussolini promptly launched an attack on the Rhineland and Ethiopia.

**Elliot:** During this period, you used a pen name. Why?

**Gold:** I wrote under the name of Clyde Crane Campbell. The other Campbell, John W. Jr., wasn't well-known enough to make it a name to avoid. The reason for the pen name? Nazism's antisemitism had spread all through the world and it permeated Street & Smith, so I knew better than to write under my own name. When Des was promoted, he recommended me as his successor at *Astounding*. I was turned down cold because of my religion. If you think I was angry, you should have seen Des! In fact, I never sold a word to Orlin Tremain, the next editor of *Astounding*.

**Elliot:** What happened as a result of the fracas over your religion?

**Gold:** I became a book reviewer for *Mademoiselle* magazine at a fat \$15 a month—and couldn't get review books from the publishers. They told me to come back when *Mademoiselle* was established! As a consequence, I had to rewrite reviews from the *New York Times* and *Herald-Tribune*, which turned out to be a bad idea. It was only a matter of time until my column was dropped. I wrote one story for *Mademoiselle*, under the name of Julian Graey (I had tried Grey, then Gray, and finally

combined them and sold one story). It was cockeyed comedy in the vein of the wild humor of the Thirties. And that was the end of that.

**Elliot:** How did you support yourself when your column was canceled?

**Gold:** Well, I was forced to return home. I sold shoes on Saturdays for \$4 a day. I would have liked to work more, but there wasn't enough business to justify it. Come summer, I became a professional "drowner." The city was threatening to lay off lifeguards on stretches of beach that were officially safe—where nobody drowned or had to be rescued. So I would swim out beyond the ropes and thrash around until the guard on the beach saved me. I had to be carried to the nearest first-aid station and revived. Thinking up a new name and address for each drowning wasn't easy, but it wasn't that ended my career. The last guard who dived in to rescue me laid his head open on his catamaran and I had to pull him in. I couldn't go from hero to victim again, and that was the end of my \$1.50 per drowning.

**Elliot:** When did you start writing under your own name?

**Gold:** After my turn-down for Des Hall's job, along came a man named Stanley G. Weinbaum, with the most marvelously invented yarns about the most lovable Martians and things you could ever imagine. The readers loved them so much that Street & Smith was forced to drop its anti-Semitism. John W. Campbell, Jr., who became editor in 1937, told me to use my own name, which I very thankfully did.

**Elliot:** How did you meet Campbell?



Photo Credit: Richard Todd

**Gold:** One day I received a splendid letter from him about a story I had dispiritedly written and submitted. It was a lackluster creation about a man and a dog getting their identities switched and their attempts to get the villain, a surgeon, to switch them back again. The real problem, wrote Campbell, was communication—how could the man in the dog's body convey his predicament to someone who could help him? I spent two months on the story—but Campbell bought it, retitled it "A Matter of Form," and ran it as his first *Nova* story.

**Elliot:** How did you break into the editing end of the business?

**Gold:** I finally wrote a short science fiction story in between fantasies and tried it out on Campbell. He wanted fantasies from me. So I gave it to Mort Weisinger, the editor of *Thrilling Wonder*. It was about the first man to land on Mars. He was a complete heel and opportunist, exploiting every opportunity to cash in on his fame. The equivalent of NASA eventually fired him off to Mars again, in order to get rid of him. Never one to leave well enough alone, Mort wanted to turn it into a tear-jerker. So I wrote a four-handkerchief story called, simply enough, "Hero." It was a stinker, a real bummer, but it sold—and it got Mort to sell me to the publisher of *Thrilling Wonder* as Mort's assistant. My first editorial job! How about that? Let me tell you how about that. It paid \$30 a week, which wasn't quite enough to support a wife, and, twenty days after Pearl Harbor, a child. It was so mechanical that two years of it destroyed the pleasure of editing. I had come to it with the most exalted feeling of exultation, and I left it with my style and pride completely gone.

**Elliot:** After that, you became interested in the detective genre. How did that transpire?

**Gold:** I went next to setting up, as managing editor, a pair of true detective magazines. Then I resigned to write a million words a year for these and other such magazines. It got so I couldn't look another rape victim in the face. So I turned to comic books, writing as many as four scripts a week. Now, that paid! And so did radio. By that time, I'd teamed up with Ken Crossen and we were on our way to the top—and I got drafted.

**Elliot:** What did you do when you left the service?

**Gold:** When I got out, I had to find something to do. It turned out to be



Photo Credit: Richard Todd

exporting rebuilt bookbinding machinery. I knew as little about this field as I had about combat engineering, which was zero, except for pushing and pulling and putting pieces of bridges together, and road grading—from the position of D-handle shovel operator. Even the infantry had pitted us. When the bookbinding machinery business petered out, I was ready to go back to writing. But what? *Unknown* had folded, and I didn't want to go back to science fiction for the very reason Des Hall had spelled out—it was too much work for too little pay. So I turned again to the comic books and soon worked my way up to the highest-paid writer in the field—and collapsed. I did, not the field.

**Elliot:** How did you get back into the science fiction market?

**Gold:** I was doing my best to recover when a girl who had worked for Ken Crossen and me called me in to present a publishing program to a French-Italian publishing firm, named, in translation, World Editions. It seems they had a big slick magazine in France and Italy that was selling two or three million copies a week. A cross between beautifully executed comics and confession stories, less beautifully executed, it was dubbed *Fascination* and set loose on the American public with a huge advertising promotion. There were five issues—the last sold 5 percent of its print order of several hundred thousand, or was it a million? I forgot. Anyhow, they were too stubborn to get out of the American market after taking such a beating, and so I was asked to submit a publishing program. I sur-

veyed the entire magazine market. It was early 1950, and everywhere I looked, magazines were in deep trouble. As soon as paper rationing had ended in 1946, everyone who could read—or could hire someone to read—was putting out everything from comics to fashion magazines. The one exception was science fiction. On the basis of experience, I should have submitted anything but a proposal for a science fiction magazine, a fantasy magazine projected for the future (once the science fiction publication was established), and a series of paperback science fiction novels. At the time, *Astounding* was rushing up dead ends, the latest being Dianetics, in John's search for a meaningful universe. Tony Boucher's *Fantasy & Science Fiction* was brand new and, I might add, flying in the face of the single immutable law of those fields: that readers don't like fantasy in their science fiction, or science fiction in their fantasy. A very high-grade science fiction magazine could fit in right between them. As a result, I offered my publishing program to the Italian representative of World Editions, a great guy named Lombi. He, in turn, presented it to the publisher, who lived on the Riviera. The publisher must have flipped a coin, because neither he nor Lombi knew anything about science fiction or fantasy. Fortunately, it came up yes.

**Elliot:** How did the name, *Galaxy*, originate?

**Gold:** I gave them a choice between *Galaxy* and *If*. I liked both titles, but I left the decision to Lombi and his boss on the Riviera. They, however, didn't know

what a galaxy was, and *If* seemed too short, so they left the choice to me. Our art director, Washington Irving van der Poel ("Van" for short), and I talked over possible cover layouts—and Frank Conley, my present wife's first husband, a great calligrapher, designed the lettering. Harry Harrison lent us his apartment to display the many variations of both *Galaxy* and *If*, on which a large number of people, including writers, artists and readers, were asked to vote. Curiously, almost all wrote on their secret ballots that they personally like *Galaxy* and the inverted-L layout, but each thought nobody else would. That was good enough for us—*Galaxy* it was, and the inverted-L layout won.

**Elliott:** What was the word rate when *Galaxy* first started?

**Gold:** The going rate was a high of two cents a word. My initial rate was three cents minimum, four cents or more for steady contributors, and \$100 for short-shorts. And we bought first-serial rights only. That broke the ceiling of two cents and Street & Smith's all-rights policy.

**Elliott:** What were the major problems you faced in getting *Galaxy* off the ground?

**Gold:** At the outset, everything was wonderful. Suddenly, writers and artists offered us everything they were turning out, and many of the "greats" came out of retirement to join us. It was a marvelous time to be alive and editing *Galaxy*. In the unbelievable space of five issues, *Galaxy* was in the black! Just in case you think I'm paranoid about being an historical Typhoid Mary, consider this—only months after *Galaxy* was born, the Korean War started. Paper became impossible to buy at any price. Our printer had negotiated a contract with a mill—or so we thought. It turned out that he had the contract, not us, and we were forced to look elsewhere. I went through the yellow pages and called every printer I found, asking if we could hook up with them. The only one who said yes was a printing broker named Robert M. Guinn, who had followed *Galaxy*'s astonishing rise toward first place with considerable awe. The paper he supplied was more like blotter than newsprint, but we missed only one issue in switching printers. In the process Bob Guinn and I became great friends.

**Elliott:** As I understand the story, *Galaxy* then became embroiled in a bitter controversy?

**Gold:** Well, back to Lombi for a Interview

moment. He was in the United States on a visitor's visa, not allowed to work here or be paid by *Galaxy*. One day he was called to Washington by the Immigration Department. He was shown a letter, everything but the signature, which stated that he was a "dirty Italian communistic fascist" who ought to be sent back where he came from. Affidavits and appeals failed. He was sent back to Italy, his visa withdrawn. I still don't know who sent that letter, but it's no coincidence that as soon as Lombi was out of the country, internal warfare developed between the American, French, and Italian offices of World Editions. We had hired an ex-music publisher as president of the American office, practically minutes before he was ready to lock his door and declare bankruptcy, and a sinisterly bluff circulation director. I told Lombi at the outset to

call in all unsold copies of *Galaxy*'s first year, but the president and the circulation director got hold of them and stuffed their garages with these soon-to-be priceless copies of the magazine. Then strange things happened to our sales. Readers wrote in and said they couldn't find *Galaxy* on any of their newsstands. The upshot was that the Riviera guy sent the head of the French office to New York to find out what went wrong. To make a long story short, the Frenchman cabled back to the Riviera that the magazine was a dud and should immediately be sold—to the American president and the circulation director. Their price was a ridiculous \$3000. I hurriedly phoned Lombi and told him what had happened. It was 4:30 A.M. in Rome, but Lombi got up and raced to the Riviera. The publisher instantly sent [continued on page 93]



## A LOOK AT THE NEW SF AND FANTASY FROM DELL

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Illustration from MILLENNIAL WOMEN



Photo Credit: NASA

production of sulfur dioxide, a major component of smog and acid rain? The licensing for private manufacture of a NASA invention may allow this. The device, called Visiplume, measures the sulfur dioxide emission by observing the absorption of ultraviolet radiation by sulfur dioxide against the normal sky background. This allows remote monitoring of smokestacks and the like, rather than the customary means of on-site inspection.

\*X-ray astronomy by instruments outside the earth's atmosphere has been making many discoveries, thanks to NASA-launched satellite observatories. Recent information from the so-called "Einstein Observatory" satellite includes the discovery of quasars ten billion light years from Earth and clusters of galaxies farther away than has even been observed by any instruments before. The "Einstein" is an improvement over previous orbiting observatories in that it carries a telescope which can produce focused images showing the structure of X-ray objects, whereas previous experiments could only detect approximate positions and intensity of X-ray emitting sources. This has allowed the study of stars that were previously invisible to optical study due to curtains of dust surrounding them, as well as the study of structures of supernovae and galaxies beyond the Milky Way. Operating only four months, the "Einstein Observatory" has already doubled the number of known X-ray objects in the universe.

\*Orange growers, oil tanker captains, and downed-aircraft searchers are among the many reported to be benefiting by satellite weather photos, according to a recent government analysis, to the tune of perhaps \$172 million a year. Among the uses of such photos are locating and riding the northbound currents of the Gulf Stream by oil tankers of the EXXON Corp., as well as avoiding them on the southbound trips (a technique first discovered and exploited by Benjamin Franklin). Another navigational use has been in the Great Lakes where photos of ice locations have allowed increased and safer shipping during the winter. In aircraft searches, photos pinpointing bad weather conditions at times of missing aircraft has enabled more focused searches. Finally, growers of Florida oranges, Hawaiian sugar cane, and other crops are able to receive hour-by-hour reports of changing weather conditions and act accordingly. The analysis called the technique of using satellite photos "the greatest significant advance in routine environmental monitoring that has been developed in history." Dollars saved they could estimate, but not lives.

-G-

## NASA Notes

Thomas L. Owen

**I**N SEEMING support of its twenty-year bias against women on space missions, NASA has released a study of the effects of simulated weightlessness on women that implies they might have problems in space. Though there are numerous studies of male reactions to space conditions, both simulated and real, until recently little was known about female physiological reactions to such simulated space procedures as prolonged bed rest, centrifuge tolerance, or lower-body negative pressure. In the study, eight women who had undergone acceleration and pressure testing were confined to bed for 17 days. Their physical reactions were similar to those of men, but four women in the study who as a control group did not undergo bedrest also had similar reactions. It was suggested that that could be the result of the stress of confinement, which would certainly be a problem in the average spacecraft. One benefit was suggested, though: their sensitivity might make women better subjects for simulated weightlessness experiments—all earthbound, of course.

\*A report with far-reaching and signifi-

cant implications has been issued by NASA. The report suggests that turbine engines may be more practical for private general use now than the piston engines used in 92% of all private aircraft today. According to the report, the turbine engine has numerous advantages over pistons, including less weight, maintenance, vibration, noise, pollution, and greater reliability and safety, as well as using less fuel. Not covered in the report were the possible effects of setting up new production lines for such engines and the greater number of turbine mechanics who might be required.

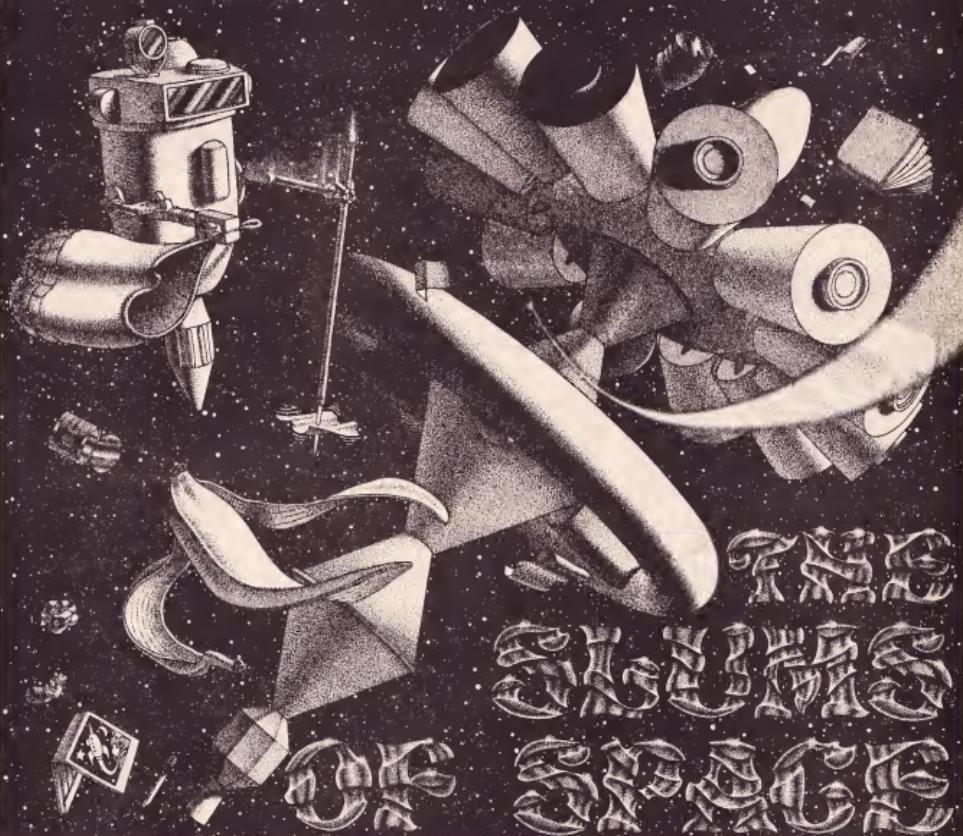
\*NASA and the European Space Agency have agreed to a joint polar expedition—of the Sun, that is. The project scheduled for lift-off in 1983 involves the launching of two vehicles from the Space Shuttle. The vehicles would circle Jupiter and then swing back to cross the Sun, one over the north solar pole and the other over the south solar pole. This project will be the first time the Sun has been observed from its polar regions.

\*Want to monitor your local oil-fueled power plant or heavy industry for the

WHO CAN TELL US WITH ANY DEGREE OF CERTAINTY WHETHER THE DRAMA WE ENACT IS COMEDY OR TRAGEDY? DOES AN UNSEEN DIRECTOR STAND BEHIND THE SCENES—OR HAS HE LEFT THE THEATER? IS JUSTIN CASE, 23, MALADJUSTED ASSOCIATE CITIZEN OF AN OVERCROWDED EARTH, THE HERO OF HIS PERSONAL PLAY—OR THE FOOL? WE KNOW THAT LIFE AS AN INDENTURED ASTEROID MINER OFFERED A GLIMMER OF A HAPPY OUTCOME TO JUSTIN—UNTIL THE DAY HIS GOPHER CRASHED ON AN AIRLESS PLANETOID, UNTIL HE DISCOVERED AND IN DESPERATION ACTIVATED THE ALIEN DEVICES THAT HAVE TAKEN HIM.....

# BROKENHEART

*by John Kessel and Terry Lee*

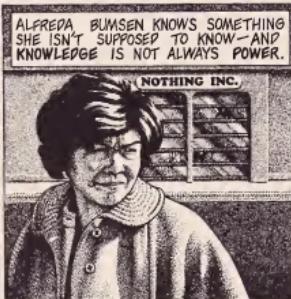
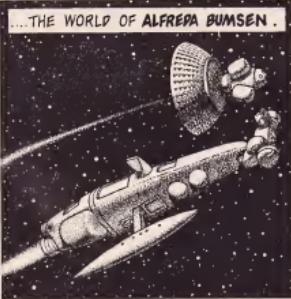
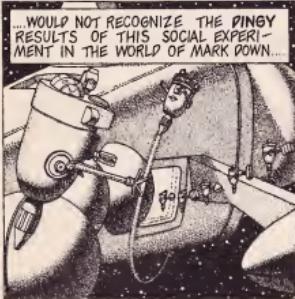
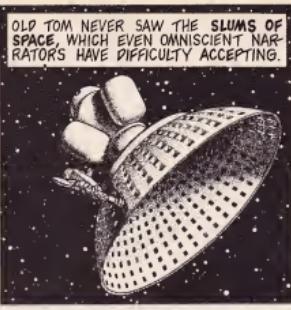
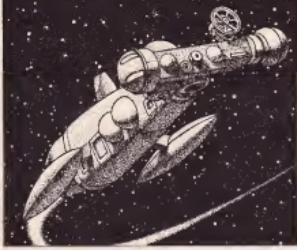


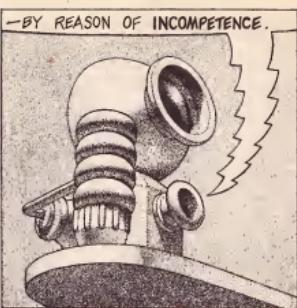
THE  
SILENCE  
OF SPACE

THOMAS CARLYLE (1795-1881) TELLS US THAT "OUT OF ALL EVIL COMES GOOD."

OLD TOM NEVER SAW THE SLUMS OF SPACE, WHICH EVEN OMNISCIENT NARRATORS HAVE DIFFICULTY ACCEPTING.

CERTAINLY A STRANGER LIKE JUSTIN CASE, FROM A UNIVERSE WHERE SUCH COLONIES ARE COMPLETELY SUCCESSFUL,...





# SOUVENIR SHOPPE



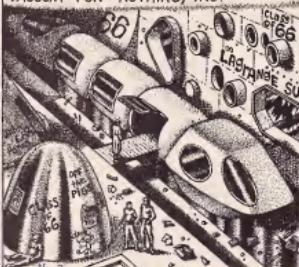
THEY WON'T FIND WORK ON LAGRANGE! TOO CROWDED THERE ALREADY, BUT THEY WON'T STOP IMMIGRATION: IT GIVES THE COMPANIES A CHEAP LABOR POOL.



THE TWO HEAD OUT ON THE NEXT FREIGHTER TO LAGRANGE.



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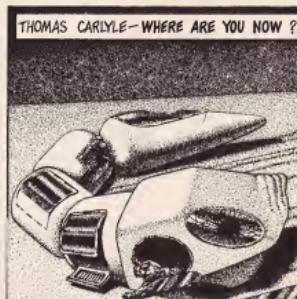
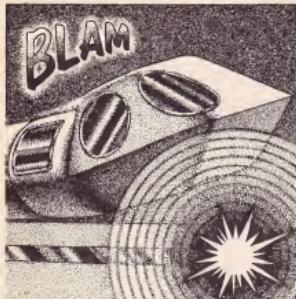
WHERE DO ALL THESE ALIENS COME FROM? HOW SHOULD I KNOW?



BUT WITH THE POPULATION DISASTERS AND ECONOMIC COLLAPSE ON EARTH, THE MARKETS ARE DRYING UP.



I'VE HEARD RUMORS OF SABOTAGE, TOO....



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# GRAVE-II

John Alfred Taylor

**G**RIEVE—GEORGE GRIEVE.” George woke with the voice in the bone-conduction transducer next to his ear. “Call in to Council Bridge.”

George brought his built-in absolute timing circuit up to consciousness as he rolled out of his bunk. It was 0224 in the “morning,” with most people in L-5 sleeping. He punched for Council Bridge; and instead of the usual watch officer, it was Helena Spink, one of the Eco representatives.

“George Grieve reporting.”

She looked less wide awake than he was, but then she wasn’t changeling. “We need you here now.”

“What’s up?”

“An emergency.”

“Will I be going Out?”

“Maybe.”

“Then I’ll come prepared. See you in a few minutes.”

He pushed his bunk up into the wall and went into the head. First rule of emergencies: Empty your bladder when you have a chance. Finished, he smeared the tip of his penis with surgical jelly, and stuck it into the sheath in his codpiece before closing the seal seam, then clipped his liquid waste exhaust valve onto his thigh. He checked his breather pack and mouthpiece and slung it and his space boots over his

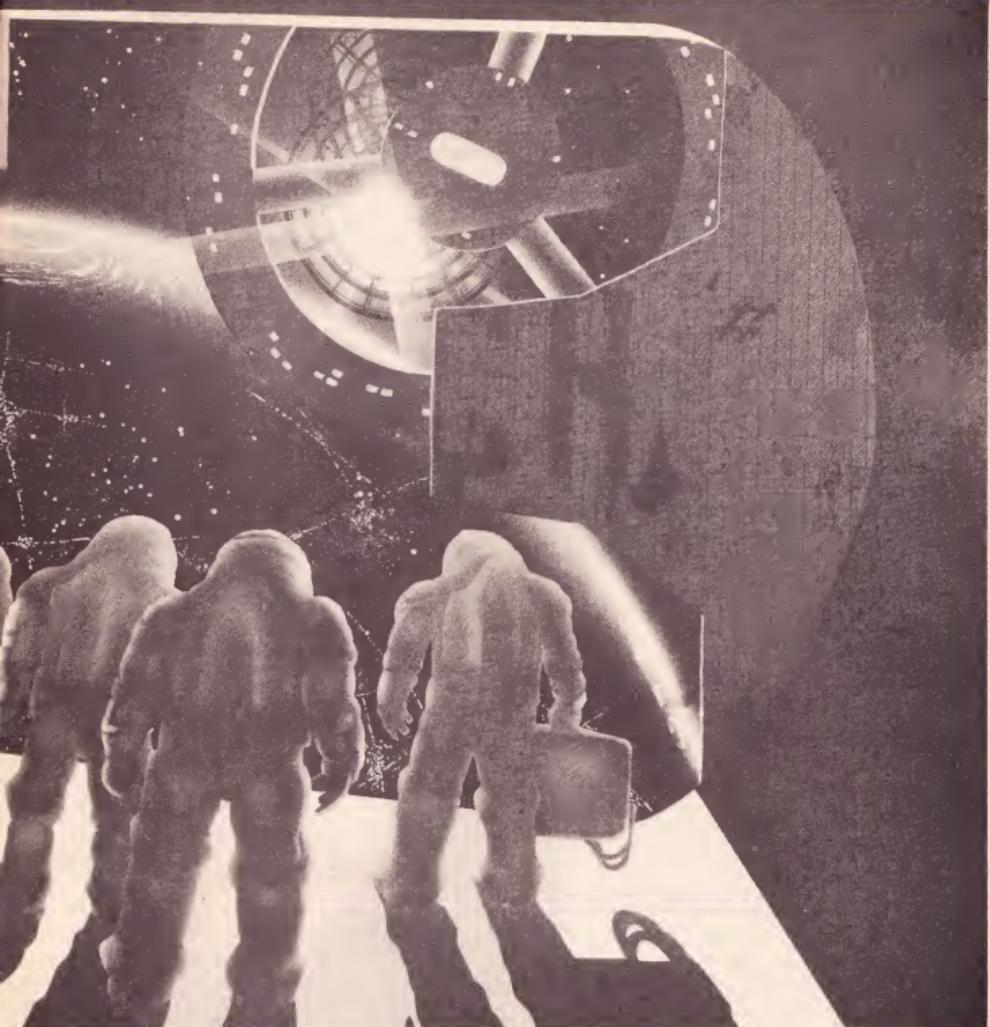


Fred Kredit

shoulder. He didn’t feel very hungry, but he grabbed a tube of workfood off the shelf, broke the seal on the end with the straw, and was sucking on it by the time he hit the door.

As an ex-loonie, George had little taste for full-G, and lived at the top of one of the taller buildings, nearer the axis of rotation. Luckily his neighborhood had a catwalk, so he’d be able to get most of the way to the Council Bridge before he had to go down and drag himself into Control Nexus.

Finishing the workfood halfway there, he dumped the tube into a waste chute, then forced himself to belch repeatedly. Eat in a hurry and you swallow air.



As soon as he came into Council Bridge, he realized that it was something big; nearly half the Council was there in various stages of dress or undress. But then he saw a too familiar face. "Bolitho—What kind of trouble have you and Outspan cooked up for us this time?"

Bolitho looked up from the hood of a hushphone. "None at all, George. Just up here on regular company business when it broke, and I thought you'd be a good man to have in on this."

"The last time you thought that you wrecked my marriage."

John Taylor

"I know."

"You actually checked?"

"Yes." And George knew that was the equivalent of an agonized apology from anybody else.

"Well, what's the problem?"

Chou, of Security, spoke from the other end of the table. "Terrorists."

"They call themselves Nekhayevists," said Bolitho.

"What's that mean?"

"It's in tribute to Nekhayev, a Russian revolutionary two hundred years ago who as good as invented terrorism. Or so

I'm told. Beyond that, I know very little of their philosophy or motives."

"So what about these people?"

"They're up here."

George's voice went up half an octave, he was so shocked.  
"In the life support system?"

"No," said Chou, "not that bad. But they've taken over  
*Grave-II*—"

"Jesus K. Christ!" George said. The gravity wave telescope, with its 20-meter long synthetic sapphire bell, so true it would ring more than five days after being struck.

"They've got limpet charges on the telescope housing and the whole shaft as hostages," Bolitho added. "I know you think I'm a cold fish, George, but what scares me isn't so much the potential loss to science, or the economic loss—though Outspan has the insurance contract—it's those eleven people under the gun."

"Any of 'em spacewise?"

"Don't think so," said Chou. "We ran visual and voiceprint makes—even on Main Lunar Memory—"

"So how did they know what to do?"

"They had advice from somebody with L-S experience—we took some telephotos of the charges, and both of them look like standard robot mining limpets; their accomplice must have taken them from one of the mobile construction shacks, and hidden them in *Grave-II*'s lifewheel."

"How'd they get in?"

"Checked into the visitor's section yesterday, and signed up for the *Grave-II* tour. As soon as they were through the lock that was it. In five minutes they'd taken the wheel and were sending the limpets out the lock."

"All this just with plastic knives?"

"They have guns."

"Guns?"

"Flechette guns."

"But how did they get them through the luggage check, the maggies, the sniffers, the sonar scan?"

Chou looked even more disgusted. "From the remains of their luggage and from what we saw when they broadcast their demands, I'd say everything was plastic, totally sealed, disguised. The barrels standard fibre-wrapped plastic pipe, the electric firing mechanism looks just like a wrist-com, and with flechettes you don't need much muzzle velocity."

"Let him see the tape," said Bolitho. "That'll make it more believable."

George's eyes believed, but his ears didn't. The man making the demands seemed to be depending on the woman next to him for cues; George couldn't tell whether they were on stim pills or always had that look in their eyes, and he only understood every other word of the manifesto. "...society of maximal infrastructure/minimal play...population parameter hypertrophy...engineering of personality or freedom to be..." The phrases buzzed in his head like flies; but when it came to the list of their demands, everything was all too clear.

"Turn off the synchronous power satellites? But millions would die—starve or freeze—maybe billions!"

"That's the idea, George," said Bolitho.

"But..."

"The Nechayevists have a formula that Earth's optimum population is less than a tenth of the present figure. And who can say they're wrong on that?"

"Bolitho—"

"I'm talking hypothetically, George. My family and friends are down there."

"I still don't understand those people."

"No more than I do. But somebody who does is on the way from Earth."

"That's a long way."

"She's coming at 4-G."

"Jesus!"

"She insisted, and Outspan and the World Federation are sharing expenses for the boost. Dr. Praz has studied terrorists, both theoretically and directly. She talked four Nechayevists into surrendering last year—"

"Sure would be nice if she could talk these around."

"Agreed," said Chou, "but if she can't... That's why you're here. If we have to take them we need your advice and help."

"See if you can raise the ship," Bolitho told the man at the communication console.

Even with computer enhancement, the picture on the big screen over the conference table was blurry. But then the people on it were submerged in oil.

"Dr. Praz," said Bolitho. One of the figures in wet suits lifted her hand slowly. "The Nechayevists will be calling back for our answer in less than six hours."

She turned and looked questioningly at the pilot, who pointed at something off-screen. Her first words were incoherent—talking at 4-G wasn't easy, and the breather microphone didn't help.

"We didn't get that," said Bolitho. The comm tech made an adjustment; the voice reconstruction was inhuman, but clear.

"Delay. We're more than an hour to turnover, so I won't be there for a good six hours."

Chou stepped next to Bolitho. "Delay how?"

"Tell them the World Federation is still discussing their demands, ask them to explain their manifesto in more detail—anything you can think of that sounds reasonable."

"But these people aren't reasonable," said Chou.

She brushed her hair off one side of her goggles, and let her hand be dragged down. "Why not patch me in? You can get it as silent readout. That way I may be some help. By the way, you should get a coded transmission from Earth soon. Lunar Main Memory bucked your recording of their statement down there, and they're running it against all records of known Nechayevists and acquaintances. And if that doesn't work, they'll try probability permutations."

"You're patched in," said the comm tech.

"Thank you," she said, "and now I think I will rest. You have no idea how much effort it is to talk."

"I have."

"Who's that?"

"George Grieve, doctor. Sorry—didn't mean to make you talk—just slipped out."

"Apology accepted. Now I'm going mute. But keep us patched in."

The picture disappeared from the main screen, but there was a new line of pale blue printing on every hooded screen around the conference table: *Dr. Marina Praz. Time to turnover 1:6:47. ETA L-5 0851.*

"Chou?"

"Yeah, George."

"Wake up Able Spaceman Avram Jacobson and Laslo Nagy. And we could use another changeling—Is Ramakrishna in from the new grid?"

"Checking," said Chou. "Yeah, he's in. You got an idea?"

"Just the beginning. If nothing else works. Sure none of these people have been in space before?"

"Absolutely."

"Don't you have to do a lot of screening before you let someone work on *Grave-II*?"

"Screening?" said Chou.

"It rotates at 3 RPMs."

"Yes, we have to do a lot of screening," said Levine from Science. "And I see what you're thinking. Maybe—just maybe."

"So what are you thinking, George," asked Bolitho.

"Well, for starters, the *Grave-II* lifewheel's rotation rate is rather extreme—it was either that or build an awfully big wheel—and the inner ear can tell—lots of people can't take 3

RPMs: motion sickness, drowsiness, depression, and such, so the longer the terrorists stay there the worse some of them will feel."

"Wonderful," said Bolitho. "But what about the hostages?"

"That's another matter. But if I can get into the lifewheel—"

"How?"

"That depends on them as much as us. But if I can get in—Well, let's just say I might be able to take advantage of certain special characteristics of a rotating environment."

"I don't know what you mean," said Bolitho.

"Do you play anything, Harry?"

"Play anything?"

"Sports, I mean."

"Squash and golf, when I can fit them into the schedule."

"Ever play either of them on L-5?"

Bolitho stared. "No."

Chou laughed. "If you had, you'd know. But I'll give you a hint: what makes storms on Earth rotate clockwise in one hemisphere and counterclockwise in the other?"

George was so busy planning and coordinating, the waiting hardly told on him, but the members of the Council could do nothing but sit and drink coffee.

"Since I left Earth," Levine said, "this is the first time I've wished I could smoke."

Bolitho grinned mirthlessly. "You can always chew your fingernails."

"A bad habit," Levine gestured toward George and the three other spacemen. "Do you think they can save the telescope?"

"Listen and find out," said Bolitho.

George and Ramakrishna were watching a computer schematic of the telescope housing rotate on the screen. Jacobson was looking at a plan-view of the standard mining limpet on his own screen. Nagy was doodling on the sketchpad clamped to his suit sleeve. "If they're as blind as Chou thinks," Ramakrishna said, "we can do it."

"We have to assume that," George said. "They aren't spacewise, and they didn't react to Chou's telephoton drone. Probably just using the automatic outside scanners."

"Lucky there are only two limpets," said Nagy.

"Lucky C-44 is such a stable explosive," said Ramakrishna.

"So all you have to do is stay out there and keep your work bulls as steady as possible in relation to *Grave-II* and each other. Once you lock on the boresight lasers, the big ones will stay on target every time a limpet comes around. Just keep steady and the computer will do the rest."

"Unless something goes wrong," said Jacobson.

Ramakrishna snorted. "Abe, you always look at the dark side. Our job's to see that nothing we can handle goes wrong. Beyond that—"

"Yeah, yeah, I know," Jacobson broke in. "You've said it enough. Beyond that, Murphy and the other gods decide."

"OK," George said, "all that's up to you three now. I've got other things to worry about."

"You can trust us," Ramakrishna said.

"George," said Bolitho, "why don't you fill Dr. Praz in on this and your other plan—she's still patched in, and her opinion would be valuable."

"OK."

George turned toward the comm tech, but already a pale blue line of letters was appearing on the screens: *M. Praz here. Grieve's 1st plan admirable, 2nd more so. Pray we need neither. Remember talk cheap in lives. Act only if necessary. But Grieve's plan's sound. Talk to them, keep talking. Better 10 hours talk than 10 seconds action. Over.*

"Thanks for the compliment," said George.

"Don't worry—We'll keep talking," added Chou.

*Good. And I'm patched in. Best wishes.*

"That's one gutsy lady," said Jacobson. "4-G."



GEORGE WAS GLAD THE TERRORISTS couldn't see Chou's knees. Chou was as cool as they came, but having eleven lives depending on his ability to keep the Nechayevis talking, to stretch things out without enraging them—George would hate to be in his shoes.

"...and the Administrator for Africa was, ah, occupied with a young lady..."

On the screen the woman Nechayeivist shouldered the supposed spokesman aside. "All very interesting," she snapped, "but how long will this delay be?"

"The World Federation should be negotiating with you within the hour."

"That means any time from two minutes from now to 0905!"

"They'll be with you as soon as they can," Chou said.

"They'd better be." And then the male spokesman leaned over and whispered in her ear. Her eyes wandered as she listened. "In that case," she continued, "we have certain short-term demands."

"Yes?"

"One of us and two of the telescope personnel were wounded in the first minutes. We want a working medbot. And we want food. But only in unopened cans. You won't drug us. And we want five more hostages, as insurance you won't reprogram the medical robot or try to drug the food."

"That's a bit much," said Chou.

"We want it now."

"We'll have to talk it over."

"You haven't time to talk it over," she said.

"All right," said Chou, "but it'll take time to organize."

"Not too much time."

"All right. We'll call when it's ready." As the screen went dark Chou turned. "There's your opening, George. I wish I could be Number Two hostage, but I guess I have to stay and talk. So who do you want?"

"Me," said Levine.

"Well, it's your telescope," said George. "But the other three are Chou's choice."

"In that case," said Chou, "I'll send three of my most inoffensive-looking agents."

"But let's delay it as long as possible," insisted Bolitho.

"Of course," said Chou, his eyes wandering to the nearest clock. "Dr. Praz will be arriving in forty-seven minutes."

"About that medbot," George said. "We don't reprogram it, but we do put placeboes in instead of motion sickness pills."

"Certainly."

"And let's take the food in in a robocart. And I'll program that. You got any tranquilizer grenades?"

"Dr. Praz is sending again," announced the comm tech.

The pale blue letters marched across the screen. *Grieve: This is last resort strategy only.*

"Yes, Doctor. We'll stay good hostages as long as we can."

George watched *Grave-II* grow in the front port. Ironically, they were using the same tourist bus the terrorists had used, but one good Trojan Horse deserved another.

He couldn't see Ramakrishna and Nagy and Jacobson out there on station. But with the running lights of their space bulls turned off, they were invisible.

And Chou or Dr. Praz could talk to him unheard through his bone-conduction transducer or send messages via the readout in his left eye, while he could subvocalize and hope the main computer could reconstruct what he said.

The pilot was steering toward the lights at the center of the wheel. Zero-G, not rotating, easier to dock in, though one learned to match rotations early.

There was another reason for the spin: besides providing weight for the astronauts, the gyroscopic effect kept *Grave-II* on target—aimed at the galactic nucleus behind the dust clouds of Sagittarius.

"Docking," said the pilot. George and the other four smiled nervously.

"As soon as we're in," George said to Chou's men, "we're going to have to bulldog the medbot and the robocart in like regular freefall steevie-deevies—everybody know how?"

"Even me," Levine whispered as the bus locked in.

Synchronized, the bus and hub locks opened together. "OK," said George, "we're hostages. Unless Dr. Praz gives the word."

Working with the gradualness of men who knew the difference between mass and weight, they unstrapped the medbot and robocart and moved them forward past the pilot and down the lock. "Disconnect and back off as soon as we're in," George said.

They moved into the roundabout, secured the medbot and robocart in the freight cage, sat themselves down, and matched spin.

Going down the elevator to the rim George groaned. "Goddam 1-G. Worse than being a hostage."

"I'm only doing this for the telescope," said Levine.

"Oh sure, Jake," George said. "Also you have three times my guts." He was able to slap Levine clumsily on the back before the door slid wide.

There were two Nechayevists waiting, both with flechette guns. Even if the barrels were plastic pipe, they were dangerous-looking. "Come out very slowly," said the skinny Nechayevist with the mustache.

"What's that?" asked the other, pointing at the robocart.

"The food you asked for," George said.

"All right, push it and the medbot out one at a time." George and Levine pushed out the robocart manually, hoping the terrorists wouldn't recognize it as powered and programmable, while Smythe and the others handled the medbot.

"OK, stop right there," said the skinny Nechayevist. "Everybody line up against the wall while we check this." The big, stoop-shouldered one backed far enough away to get them all with a single spread of flechettes, while the skinny one opened up the robocart and checked its contents. If he found the trunk grenades, it was all over. They'd done their best to hide them, but people able to smuggle flechette guns into L-5 would be hard to fool.

"Looks clean," the skinny one finally said. "Push 'em that way." He and the other dropped back, and the hostages pushed the medbot and robocart down the main access hall of the lifewheel. In the shadows above the partitions the cables and struts of the lifewheel rose toward the hub. As George walked he compared what he saw with the plans he had memorized. No point in calling up a readout while moving.

The main workroom stank of fear and vomit. The astronomers were all sitting in the middle of the floor under the guns of the two George had seen on the screen. The woman was ferociously alert, but George was glad to see that the man was sunk in gloomy introspection, and that the fifth terrorist was lying down in the corner, green-white with nausea, his eyes closed and his gun forgotten beside him. Good old 3 RPMs!

"Put them with the others," said the woman. In spite of their stress, most of the hostages looked healthy enough, though one was unconscious with a crude bandage on his head and another had a bruised cheek and eye swollen almost shut.

"No talking," said the woman, and went over and began examining the medbot and robocart. If anybody noticed the grenades it would be her. George watched her through superimposed vector readouts from his other eye. If she found them, he would have to move instantly.

"All right." George eased back and switched the readouts to plans of this part of the lifewheel, looking up past the lights at the darkness toward the hub.

The medbot went into action. George cheered himself with

the knowledge that the Nechayevist with motion sickness would stay sick, though the unconscious man and the woman with the shiner were being helped.

Light blue script appeared in his readout. *Attn attn Grieve. Probable ID on male & female leaders recd L-5. Frm what I hear both dangerous, clever, fanatic, ruthless. Keep peace if possible. ETA 27 minutes. Luck.*

"Thanks," George subvocalized, "will do what you say. Can you understand me?"

Yes said the blue script at the same time Chou's distorted "Loud and clear enough" throbbed in his ear.

Dangerous? She looked it, and her companion had come out of his gloom enough to drain most of can of orange juice. Both seemed competent in a feverish sort of way, and George wondered what made them tick, why they were at feud with the rest of the human race. Seemed a damned waste of talent.

The situation was interesting. Mom and Pop were sitting on the swiveled chairs of the control console, Skinny and Stoopy were over there, the fifth Nechayevist was still occupied with his innards, and Smythe and Levine and the other new hostages were all in the front row with him. And there were no suspended lights directly overhead.

For all George's training in exact estimation of distances, it was comforting to know he could check them against the plans. The partition wall there was 2.5 meters high and almost three meters away; no, more like 2.72. And Skinny was about four meters to his left, and Stoopy about five and a half to his right front—

*What is situation? ETA 18 minutes.*

"No change. Looks like my plan can work if absolutely necessary."

*Hope not.*

"Me too."

The two of them were getting restless; George couldn't quite hear what they were saying, but they were saying a lot, though without taking their eyes from the hostages. Very slowly George looked to his left and right: Skinny and Stoopy were still alert, though a bit strung out.

*Your ETA 11 minutes, Doc?*

*Yes.*

*Tell me more about these people.*

*Personal details won't help you, George.*

*Then tell me what will.*

*Just so you know how they think, a quote from Nechayev, the man they named themselves after: quote. The revolutionary is a lost man; he has no interests, no habits, no belongings—Everything in him is absorbed by a single exclusive interest, one thought, one passion: the revolution—He has broken every tie with the civil order, with the educated world and all its laws—He will be an implacable enemy of this world, and if he continues to live in it, it must be only in order to destroy it. Unquote.*

*"Help!" said George.*

*As much as we can give. But thought U shd know how they think.*

*"Not sure I want to know that much."*

*ETA 9 minutes.*

The head Nechayevist had come to a decision, because they were beckoning Skinny and Stoopy over. A not too nice decision, judging from the way all four were looking at George and the other hostages.

Skinny and Stoopy went back to their original positions, but with new tenseness. The woman turned to the control console, while her companion swiveled his chair around; he and Skinny and Stoopy could deliver a withering crossfire at their captives, with no danger of hitting each other.

Chou appeared on the screen. "Yes?"

"Unless we hear from the World Federation in five minutes we shoot five hostages. And five more for every five minutes delay."

Chou talked almost as fast as he thought. "They've appointed a negotiator, a person already on the way to L-5, and she'll be docking in a few minutes."

"We'll wait ten minutes. Then waste ten hostages." She slapped the board, the screen went blank.

George re-estimated every distance, ran the vectors and the plan views again. He felt as shaky as Chou; you could live with personal on-the-job risk, but this responsibility—if he did the wrong thing, all of them might die, and the System lost its only gravity wave telescope.

Usually the inner layer of his exoskin, with its carefully-engineered combination of elasticity and absorbency, kept him comfortable in any environment, but now he felt clammy. Too much adrenaline. If something didn't happen soon he'd be sick. Even workfood had its drawbacks.

Think about nothing. Be the unclouded mirror. Breathe and watch, breathe and wait.

The woman Nechayevist got Council Bridge again. "Where is your negotiator?"

"Almost to the door. Be patient—a few seconds—"

"We've been patient—"

Chou turned, and Dr. Praz was beside him, still in her wet suit, hair straggling and forehead marked by goggles, but her eyes, even ringed with fatigue as they were, darting with dark intelligence. "May I present Dr. Marina Praz."

"Dr. Marina Praz!" The Nechayevist uncoiled from her chair in a single motion. "If the World Federation wanted to negotiate in good faith they'd've picked somebody else. Anybody else. Dr. Praz is the enemy. You've just killed all these people. And *Grave-II*." She cut the circuit.

As she swiveled and started to raise her gun, George's left eye readout glowed blue. Sorry. Go anytime.

But George had already triggered the programmed robocart and given Ramakrishna and the others outside the word in the same instant: the survival of *Grave-II* was their problem.

George's problem, as the robocart began to lurch back and forth between the two Nechayevists at the console, was when to jump. He gave a correction signal, and the cart smashed into the man's legs. Then George jumped, landing on the cart as it stood still for a moment. His next leap demanded less strength, since he was nearer the axis of rotation. But he was going up and sideways, and got his head and shoulders over the partition just as she fired. Coriolis force made her almost miss. George felt a sting in his right heel, dragged himself up by holding onto a strut and balancing himself on the partition edge, then jumped again.

Grabbing the cable hurt like hell, but he spun himself around and looked down past the lighting panels. Hanging there, he split his consciousness to interface with the robocart, sent it lunging back at her through the spreading mist of the trunk grenades.

Guns were coughing, too; thank God they were single shot and had to be broken to reload. But the flechettes would spread—

He interfaced with the lifewheel computer, switched off the lights, switched on the alarm klaxon, switched the lights back on. He hoped that was sufficient distraction, because he had to go back down there, where personal survival would demand all his attention.

Another gun coughed. He slid down the cable, wincing as it cut into his palm. He didn't want to drop back into 1-G too hard; arch supports were fine, broken bones weren't.

He landed on the stopped cart, and the woman raised her weapon. He jumped desperately, instinctively.

He slammed into her with his hip, one hand striking the gun. It flew out of her hand and went off when it hit the floor, sending flechettes ricochetting around the room, but by then he was lying on top of her and she was unconscious.

There had been no change in the smooth motion of the lifewheel, which meant Ramakrishna and the others had

succeeded in burning out the limpets' firing circuits. He turned off the klaxon, and things began to make sense. Everybody was out except Levine and the cops. Levine was bleeding from a wound in his forehead and one on his hand, and one of the security men was barely conscious, with half a dozen flechettes in his gut.

"Hope they aren't poisoned," Levine said. "Do like the telescope but I like me more."

"Hope so, too." George grinned through the fixed metallic lips of his breather mouthpiece seat. "Since if they are, I am too. Worring won't do us any good. But the medbot might help him."

"Yeah," said Levine, dragging the security man toward the medbot by his shoulders. "If it helps us at all."

"We're all dead if it doesn't," George said. "So let's revive everybody—after we handcuff the right people." He went over to the robocart and pulled out a liter can labeled *Tomato Juice*. Inside were forty injectors of the same trank antidote he and Levine and Smythe and the other two had taken.

It was a wild party, a noisy party, a triumph over fear and death. Even the wounded security man was there, in spite of his doctor's advice. "Certainly makes me feel a fool," shouted Dr. Praz against the din, "coming all that way only to be the one person who'd trigger the blowup."

"You couldn't have known that, Marina," George shouted. "Besides, you bought us time."

"He's right," Chou yelled, "I'd have never been able to stretch it out, if I hadn't known you were coming, and if you hadn't been second-guessing me every moment."

"I felt so useless, so helpless."

"So did we," said George.

Later, slightly looped and sitting on a viewing balcony with Marina, George watched the stars wheeling under their feet. He wanted to make a pass, but her status bothered him; he'd never been attracted to a woman with a Doctorate before. To gain time he asked her something he wanted to know anyway. "Why did they have to do it? There are so many opportunities, even on Earth—"

"Even on Earth?" Marina asked in mock malice.

"You know what I mean," George said.

"I suppose I do."

"Well, why did they have to end up Nechayevists? They seemed intelligent enough."

"Yes," and all lightness vanished from her mood, "they are." Now she was Dr. Marina Praz. "George, imagine a person that intelligent, not really lazy, but so unwilling to commit himself, so insistent on keeping all possibilities open, so determined to avoid the quotidian—"

"The what?"

"The everyday—Anyway, so determined to avoid the everyday he won't take a permanent job—survives on his social support allotment instead. Therefore can't afford any entertainment but dumb-vid—"

"Oh, dumb-vid, uh-huh."

"You see what I'm getting at," she continued. "How do you feel when you have to sit and watch non-interactive TV?"

"Bored."

"And manipulated and angry. Especially without meaningful jobs. Meaningful work is a great luxury, George."

"I guess I see your point."

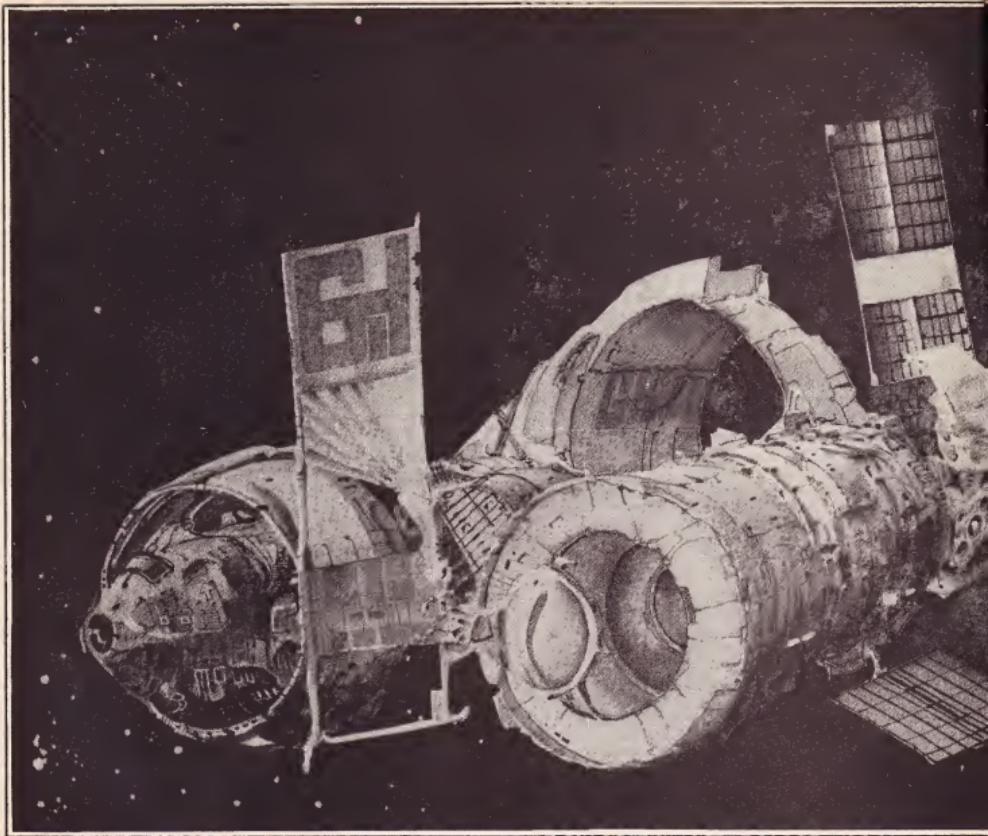
Neither spoke. They watched the turning stars beneath.

"Why not stay here awhile—you'll like L-5."

"I already do," she said. "And I'll be here for weeks till the trial is over. Both witness and observer."

"That's nice," said George.

"Yes." Marina smiled, and since she wasn't changeling, wore no mask, George thought he knew, hoped he knew exactly why she smiled.



# HOMING PIGEON

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Connie Willis



After Stevens

**D**R. MICHAELS WAS AWAKENED FIRST. She opened her eyes and looked at the panelled oak ceiling. There were both writing and a red light directly above her head. The writing said, "Maintain position until arousal tests are complete. Light will flash green." The light remained red. Dr. Michaels sat up. She looked around.

Dr. Borodrin fought the waking. He rubbed his eyes with his fists. He yawned. Writing and a red light were above him, too. He reached up and poked at the light. The light abruptly changed to green. Dr. Borodrin jerked his hand back as if he had been burned.

"Congratulations," said the computer. Its voice was a composite of Dr. Borodrin's father and Dr. Michael's physics professor. It spoke very fast and low, almost murmuring. "This is marvellous. You have both successfully come through nearly two years of dormancy-glacé. The monitors inform me there have been no ill effects of the period of cryogenic dormancy and that arousal has been completed. All is ready for a swift, and I hope, pleasant homeward journey. Although you are already familiar with the directions, I will

Connie Willis

repeat them now. The console, located in the desk top, contains the coding keyboard. To instigate program A-1, punch the following code into..."

The professor's voice murmured pleasantly on. Neither Dr. Michaels nor Dr. Borodrin paid any attention. They had both tried to stand up, but could not. They were restrained on their bunks by straps across their hips. Dr. Michaels tried to yank the strap apart. Dr. Borodrin explored the buckle mechanism thoroughly. He attempted to put it in his mouth. After a while Dr. Michaels lay down and fell asleep again.

"After the complete code has been fed into the console, remove the readout for exact information about location and return schedule."

The football coach's wife drank. The wife of the basketball coach did macramé. There were ugly knotted contraptions holding plants and fat candles and hanging all over her front room like nightmare jungle vines. Houston had said no crafts. Baker thought it was nearly impossible to class the lumpy wads of hemp as a craft, but she was still obviously out of the question. No drinking, Houston had said, no sex, no crafts.

GALILEO 39

The wife of the wrestling coach was not at home. She had left a note on the door for her husband: PTO Exec Counc Casserole. The wife of the girls' volleyball coach was home and sober, but in helping Able off with his coat, her hand slid across his chest caressingly. No drinking, no sex, no crafts. Baker told her he was a private detective, and she promptly helped Able on with his coat again and shuffled them out the door. The wife of the track coach was home, sober, and not interested in Able's chest. She told them she did not mind the hours at home alone at all, that she prayed unceasingly for her husband from sunup to sundown. She quoted several verses from St. Paul about the man being the head of the household and the wife being the doormat.

"No," Baker said.

"We're running out of coaches," Able argued.

"We'll find her."

"Personally I doubt if she even exists. I think she's a fragment of Dr. Borodrin's senile imagination, like that stupid computer that had to sound like a cross between God and the kindly old country doctor before he was satisfied. He had me chasing all over the country taping voices. Now he's got us after a coach's wife with a waiting hangup. It's one wild goose chase after another."

"We'll find her," Baker said.

Dr. Borodrin unsnapped the buckle. He snapped it again. He unsnapped it. One end of the strap fell. He bent over and with great difficulty retrieved it. The strap had gotten twisted and the two sides would no longer fit together. Dr. Borodrin hit the two halves of the buckle and then stuck one end in his mouth, twisting it again as he did so. He sucked on the buckle. He tried the two halves again. They snapped together. He snapped and unsnapped them, over and over again.

Dr. Michaels woke up. She watched Dr. Borodrin a while, then unsnapped her own buckle and stood up on the bunk. She sat down again, turned around, and slid off the side onto the floor. The gravity in the cabin was only about two-thirds of normal. She slid on the slick floor and sat down hard, with a surprised look on her plump, middle-aged face. She stood up again without much difficulty and latched onto the bunk with both hands. She edged around to Dr. Borodrin's bunk, still holding on. He would not look at her; he was snapping and unsnapping the buckle. She watched him, then she walked over to the bookcase.

The interior of the cabin had been designed to look warm and comforting. The bunks were covered with plaid ribcord spreads like those in dormitory rooms. The computer console was built into a wooden rolltop desk, piled high with papers and stray pencils. All of their books, as many as they had wanted to bring, were in a large walnut bookcase against the slanted cabin wall.

When Dr. Michaels started pulling the books off the shelves and dropping them, they fell slowly, angling away from her because of the coriolis effect of the spinning ship.

"Activate program B-5," the computer said. "Delay in doing so will result in my having to go to override. I realize that your excitement in awakening and finding that dormance-glace has become a viable reality for space travel may have resulted in an attitude of celebration. However, I must appeal to your mature sense of responsibility in activating your return journey. I repeat, I will have to resort to override."

Dr. Michaels took another book off the shelf and dropped it.

The wife of the gymnastics coach was home, sober, and had no knots holding anything. Her name was Janet. She had short, blondish hair that she tucked behind her ears. Able began to look hopeful.

He showed her their fake press cards and introduced himself and Baker. "Rex O'Conner. Tony Worth. *Life* magazine. We're here to do a layout on coaches' wives. We're calling it, 'The Lamp in the Window!'"

"What an utterly charming title," she said with a straight face. Baker began to look hopeful.

"Nobody appreciates you coaches' wives, you know. Except *Life*, of course. We realize what a terrific job you're doing, sitting through all those games on those hard bleachers, serving potlucks to the team, cheering your husbands on, helping them win, waiting patiently for them to come home after a bone-wearying practice session, practically holding America together at the seams!"

"It isn't quite as heroic as all that," she said cheerfully. "Actually, it's a pain in the ass." Baker stopped hoping and started grinning.

"Listen to that, will you?" Able said to no one in particular. "She thinks what she's doing isn't heroic!" He shook his head in amazement. "Now that's just the kind of stuff our magazine wants. The loyal little woman, the faithful lighthouse beacon, the—"

"The thing is," Baker cut in earnestly, leaning toward her, "we think you are in a special position to know about waiting."

He did not have to explain what he meant. He did not have to ask a single leading question. She said immediately, "I have a theory about waiting."

Baker leaned a little bit farther forward.

"Coaches' wives are in a perfect position to know about waiting, you know. They're not worried, like they would be if their husbands were on the road or in a war or something. They're not even lonely. Both my girls come home at three-thirty. They're just waiting, pure and simple. It is like a lighthouse, kind of, except it's steady. I love you, come home, come home."

"All the time?" Baker said.

"Oh, no. In the morning it's housework. And in the afternoon it's soaps and cookies for the third grade party, things like that. But from four to about six—after six I fix supper and straighten up the house—from four to six, though, no matter how hard I try, all I can do is wait. I don't know what that is, but I have the feeling it's something every coach's wife has to come to grips with."

"Have you come to grips with it?"

"No. Mostly I fight it. Sometimes I give in to it. Sometimes, when it's really bad, I try to figure out a way to harness all that power. Hook it up to windmills or something. I mean, waiting is a whole untapped energy source. If it could be put to use, it could move mountains." She stopped. "I've been thinking about it a lot lately." She sat back. So did Baker. "Is that what you meant?"

"I want to get a picture of you," Able said, "over by the window, with your hand up to your forehead, like you're looking for someone, sort of a beckoning expression on your face. The lamp in the window look."

"She's the one," Baker said.

"I don't know," Able frowned. "I kind of liked the track coach's wife, the Christian."

"No," Baker said.

"I don't see why it has to be a coach's wife, anyway. There are lots of other people waiting around. Just because his father was a football coach and his mother sat around waiting for him."

"His mother was a Ph.D. with an IQ of a hundred and eighty. She wrote a paper on the dynamics of waiting."

"I'm not sure but what you've messed up our chances, anyway. You didn't act like a reporter at all. She probably won't let us back in the house. She'll probably have the police waiting for us."

"She's the one," Baker said.

Able called Houston from the motel. "We've got our pigeon," he said. He looked over the phone at Baker. "Homing pigeon. Get it?"

"No," Baker said.

"Homing device. Pigeon." At Baker's look, he said, "Pigeon, dupe, sucker. *Homing pigeon?*"

"No," Baker said, and looked thoughtful.

Dr. Borodrin tired of the buckle. He snapped it one last time, then slid his chubby body out from under it. He walked, sliding a little, over to the bookcase and began pulling books off the shelf. Dr. Michaels hit him on the top of his bald head with the one she was holding. Dr. Borodrin howled.

The police were not lying in wait. The gymnastics coach's wife did not refuse to let them in. She smiled and took their coats. "I'm sorry," she said, "I don't remember your names."

"Neither do we," said Baker.

"We have a startling confession to make," Able said. "We are not really reporters." He paused dramatically. She didn't look particularly startled.

"We were not able to reveal our identities until we had completed certain essential tests. The tests are now complete. Allow me to introduce myself: I am Dr. Reginald Girous. This is my associate, Dr. Paul Winters. We are affiliated with the parapsychology unit at Duke University. Perhaps you've read our monograph on telekinesis." He showed her their fake faculty L.D.s. "Our tests, taken in a random pattern sampling with median sorting, indicate that you have an extraordinary predisposition to extra-sensory perception."

"I do?"

"Everyone, of course, experiences the extra-sensory to a certain degree in what we call charged emotional experiences. Probably you have had many experiences of 'knowing' in your everyday life."

Janet looked at Baker. "I can't even beat my kids at animal rummy. I can't even remember what's trump in bridge, let alone know who's got what."

"Bridge is hardly a charged emotional experience," Able said.

"You've never played bridge with my husband."

Baker grinned.

"Nevertheless," Able said valiantly, "we feel you are extraordinarily gifted, and we would like you to participate in a home-based experiment for us in selective telekinesis." He didn't give her a chance to object. "There is of course no obligation on your part; participation is strictly voluntary. We'd like you to weigh the advantages and let us know your decision."

He sounded exactly like a vacuum cleaner salesman. Janet was not watching him. She was watching Baker and frowning slightly. "I'll think about it," she said.

Connie Willis

"What do you think?" Able asked on the way to the motel.

"I think you sounded like a vacuum cleaner salesman."

"Seriously," Able said.

"Seriously. You really did sound like a vacuum cleaner salesman."

Able looked annoyed.

"All right," Baker said. "I'll tell you what I think. I think we should tell her the truth. Seriously."

"We can't. She doesn't have the security clearance. She wouldn't believe us if we did tell her."

"Oh. I don't know. You made a very good case for telekinesis back there."

"This isn't pushing playing cards around on a table."

"She can't help us unless she knows."

"Knows what? That a crazy old scientist jimmied the override on the biggest NASA project in ten years? That he's out there floating around somewhere and won't even answer us? That he's so crazy he thinks a coach's wife can get him home just by *waiting*?"

"I think she'd go for it," Baker said.

"How the hell could she go for it? I don't even go for it. So he's got a mother complex. Is that any reason for us to go chasing after a coach's wife, any coach's wife?"

"Not any," Baker said. "It had to be this latitude. It had to be this time zone. You saw the paper his mother wrote—maximum power from four to six, she said. Untapped source of energy, she said. And Janet says the exact same things."

"Janet?" Able said. "Janet? She can't even beat her kids at animal rummy. She's not going to be able to bring them home, no matter how much waiting she does."

"Maybe," said Baker.

Dr. Michaels and Dr. Borodrin broke into the food supply with a book. They pounded at the door of the cabinet until the edge of the book accidentally sprung the catch. They could not manage most of the containers, but the plastic ones they were able to split open with their teeth and suck the contents out. Dr. Borodrin dropped an empty pouch; it fell onto Dr. Borodrin's body and then onto the floor as if there were a wind blowing. He picked it up and dropped it again.

Dr. Michaels sat on the floor and worked at the bottom button of her sweater until it came through the buttonhole. Dr. Borodrin had insisted that Dr. Michaels be allowed to wear the sweater throughout the dormance, even though the techs were concerned about the behavior of a natural fiber at low temperatures. Dr. Borodrin had been adamant.

There had been intimations of trauma during the first of the longer experiments, consisting mainly of a temporary disorientation and slight regression. That experiment had been done on the moon shuttle. The actual time spent in dormance was only a few hours, but the subject, the daughter of one of the techs, had sat up on her bunk after arousal and begun to wail, a tearless bawling Dr. Borodrin had no idea how to interpret. He had spoken to her, without any response, and Dr. Michaels, who had come in saying, "I thought I heard a baby in here," had attempted to soothe her. At that moment her mother's voice had come over the radio. The subject had quieted at the familiar voice and then begun quite calmly to go through the operations of getting out of her bunk and operating the program. She could not remember anything afterward except a vague loneliness.

Successive testing was done using loved ones' taped voices for arousal instructions. There was no recurrence of

disorientation.

When the preliminary Snowflake experiments were done, neither Dr. Borodrin nor Dr. Michaels suffered ill effects from prolonged dormance. However, a surrogate-voice was provided as a back-up measure since both of their parents were long since deceased. Great care was taken to provide a home-like and reassuring atmosphere in the ship, and Dr. Borodrin insisted on the inclusion of his pipe and Dr. Michaels's sweater.

The buttons of the sweater took Dr. Michaels quite a while, but the zipper on her jumpsuit was simple. In no time at all she had wiggled out of all her clothes and dropped them on the floor. She found her body interesting, but not indefinitely so. After a very few minutes she set to work on Dr. Borodrin's zipper. She was delighted with what she found.



OU HAVE HEARD OF COURSE," Able told the gymnastics coach's wife, "of the near-decimation of the American bison during the period known as the American expansion?"

"There was something about it in the paper," she said. Able had already shown her their fake NASA Department of Oceanography I.D.s. Their new names were Novello and Bolton.

"Mine's still Janet," she'd said.

Baker put his fist up to his mouth and glared at the new macrame plant holder. Able had stopped short when he'd seen it and looked at him with an "I told you so" look, but it had developed that the basketball coach's wife had given it to her and that although she herself did do quite a bit of sewing, she did not do crafts.

"Their extinction was due not to the wholesale slaughter of their herds, as is often imagined, but to the destruction of their migratory patterns by unnatural barriers like the transcontinental railroad."

"It would seem to me that the wholesale slaughter didn't help, either."

"Well, of course, but it was the *barriers* that eventually..." Able sounded annoyed. There were three large wooden beads woven at random into the rope, one yellow and two a poison-gas green. Baker wondered if they served any useful function, such as covering up knotting mistakes. "...and the whale finds himself in exactly the same position today!"

"I had no idea there were transcontinental railroads in the ocean," she said. "Now maybe Don and I can go to Europe. The train is always cheaper."

Even Able occasionally knew when he was being teased. "Of course there aren't any railroads. But there are *barriers*. The shipping lanes and the cables and the oil rigs, and now with the MAP project, the whole mid-Atlantic plate edge is full of machine noise. Static to the whale, who depends so much on the calls he sends to his mate, static that keeps him from getting to his mate and threatens him with certain death."

Actually that didn't sound too bad. The next part, about whales being psychic and about her calling them home across the ridge like calling a dog was the tricky part. Baker folded his arms and squinted at the beads. He tried to make a symmetry out of them. Impossible. All those ridiculous knots and lumps of bilious green resolved themselves into a determined chaos. He was glad they hadn't tried to use the basketball coach's wife.

Able said, "All this is of course so top secret that there isn't

even a security classification for it. We could not tell you our real mission until we were sure that the attempt to lead the whales home with decoy Russian trawlers had failed."

Baker snapped out of his reverie. Russian trawlers?

"All else has failed. You and hundreds of others like you are the only hope for those poor stranded whales, longing to come home, but trapped on the other side of the ridge. Will you help deliver them into the arms of their loved ones, in memory of the lost buffalo?"

"Actually," she said, "there are some very large herds in South Dakota. We even have some in the zoo here."

"That's not the point!" Able said.

Janet turned to Baker and looked at him, directly, inquiringly. "What is the point?"

"We want you to sit every day, during what you call your worst time, from four to six, and wait for your husband to come home."

"That's all?"

"That's all."

"No whales, no magazine interviews, no playing cards?"

"No," said Baker.

"Can I do my hand sewing while I wait? It helps me concentrate."

"No," said Able.

"Yes," said Baker.

"I sit for two hours every day, and instead of fighting it, I say, come home, come home, as hard as I can."

"That's right."

She looked suddenly sad. "Somebody's out there all alone, aren't they? Nobody even knows where they are?"

"How did you know?" Baker said.

She smiled. "Housewives have the same problem," she said. "When do you want me to start?"

"See?" Able said on the way to the motel. "I told you this was the way to handle her. We never would have gotten her by just walking in with some bullshit story nobody'd believe."

"What do you call what we told her? Russian trawlers. For Christ's sake."

"She's going to do it, isn't she? If she isn't doing it for the whales, who's she doing it for?"

"I don't know." Baker sounded angry. "How the hell would I know? Maybe she's doing it for the poor extinct buffalo."

The temperature in the cabin had been set for regular indoor clothing. Dr. Michaels and Dr. Borodrin slept on the floor, huddled together like kittens. Dr. Borodrin had pulled one of the ribcord bedspreads off onto the floor. He slept with a corner of it under his cheek and his thumb in his mouth. The bedspread did not cover either of them.

Dr. Michaels woke up, instantly awake. She was shivering. She shoved at Dr. Borodrin. He moaned softly in his sleep. She grabbed the corner of the bedspread away from him. His head thudded gently against the floor, but he did not wake up.

Dr. Michaels crawled over to the food cupboard. She pushed aside cans and boxes until she found what she wanted. The plastic pouch was at the back. She bit down on the pouch and yanked hard with both hands. Some of the semi-solid food spurted onto the cupboard door. Dr. Michaels sucked all the food out of the pouch.

The voice of the computer no longer muttered professorlike. Its tone had become deliberate and kind, as Dr.

Borodrin's father had when he was worried. "In the event of failure of automatic override, it is imperative that alternate program B-9 be read into the console at the earliest possible moment. Delay has increased return time by more than one week. Failure of override necessitates . . ."

Dr. Michaels pulled herself up by the bookcase and walked back to where Dr. Borodrin was sleeping. She got down on all fours beside him and poked her finger experimentally into his eye. Dr. Borodrin stirred, reaching out and getting hold of a piece of the bedspread again.

The radio cut in. "This Houston. Come in *Snowflake*. Dr. Borodrin, Dr. Michaels? Are you there?" Dr. Michaels lay down next to Dr. Borodrin. She fitted her naked body into the shallow curve of his. She closed her eyes.

Dr. Borodrin flung an arm over her. She opened her eyes again and turned to face him. Together they tumbled on the floor amid the litter of books, empty plastic pouches, and their discarded clothes.

**F**ROM FOUR ON, EVERY AFTERNOON, she waited. The sun streamed in through the third week in October, lighting the shimmering dust in the air. The girls played outside, banging the door on their passage in and out. She sat on the couch in the living room and hemmed Corrie's long skirt. She sewed sequins in neat unyielding rows on Bet's socks and put facings in a new dress for the fall concert. She sewed with neat, even stitches on the lengths of kettlecloth, corduroy, red gingham. She let down Corrie's blue jeans and Bet's nightgown. She basted the sleeves in the fall concert dress.

She waited, calling out ceaselessly, patiently, "Come home, come home!" She called out through the smoke-smelling afternoon. Come home, she thought, steady as a beacon. Come home.

Her husband's car hit the driveway like a race car, throwing up clouds of dust and spattering gravel on the children's bikes. Janet put her sewing down and met him at the door.

"Are you all right?" he asked, looking white and strained.

"Was there another bomb scare?"

"No, I . . . where are the kids?"

"In the family room. Watching TV."

Don walked swiftly to the open door and looked in. She had sat back down on the couch, leaning forward to him. He did not sit down. He paced back and forth in front of her, disturbing the pattern of light and suspended dust streaming in through the window. "I . . . it's the craziest thing. All of a sudden I had this urgent, I mean *urgent* feeling that I had to get home. I can't describe it. It was like I knew something had happened to you or the kids, but I had no idea what. I just ran out of the gym."

"Did you send the girls home?"

"No, the assistant's got them. I suppose I should get back. Southworth is Friday." He ran his hand through his hair. "It was the craziest thing. I just felt *pulled*, you know?"

"Is Cheryl's aerial ready for Southworth?"

"No. I promised I'd spot her on it." He stepped toward the door. She picked up her sewing. "Are you sure you're all right?"

"I'm sure," she said. "You know how scared Cheryl is about putting any weight on that bad wrist."

"I'll tape it," he said. On the way out of the driveway the car did not raise any dust. He paused and looked back at the house after he was out in the street.

Connie Willis

"How's she doing?" Able asked when Baker had hung up. "Okay. She's having trouble keeping the thought impersonal enough."

"What did you tell her?"

"Don't worry. I didn't tell her the truth. I told her to think about God."

"Good. But otherwise?"

"She's doing it. Every day."

"I still don't know about her. I mean, everybody's got a secret flaw somewhere. What if she's got a boyfriend or something?"

"No," Baker said.

"It's not so improbable. Look at her, home alone while her husband fools around with young girls in leotards. What is she, thirty? That's the sexual peak in women."

"No," Baker said. "Even if she . . . she still wouldn't do anything about it. She's not the type."

"Just the same, I'm going to have you do all the talking. There's no point in placing temptation in her way."

"No," said Baker. "there's no point."

Dr. Borodrin rubbed his eyes. He sat up in the huddle of clothes and bedspread. He did not look at Dr. Michaels. He walked carefully over to the rolltop desk. The console was featureless, a flat plate of opaque black plastic set into the wooden surface of the desk. Dr. Borodrin patted the surface gingerly. The surface lit, revealing the keyboard behind in colored lights. He patted it again, his hand splaying wide over the lights. Then he toddled back to Dr. Michaels and lay down next to her.

The sky darkened and spat snow through the last week in October. Corrie and Bet played Candyland and Skunk in the family room. Janet put the hem in the fall concert dress and basted in the cuffs. She sewed buttons on Don's good wool jacket. She found the Molasses Swamp card. She patched Bet's jeans where the leg had caught in the sprocket of her bike and chewed a ragged hole. She patched Corrie's jeans where she had fallen down on the playground and ruined the knees. She found the lost Skunk dice. She put the buttons on the fall concert dress.

She did not think about Don. She thought about a gaudy gravure from her Sunday school days of the good shepherd out clambering down the side of a cliff to reach the bleating lamb. He did not have any shoes on, and he clung with one hand to a scrubby bush and reached out with the other to the animal. She stood above them on the cliff. Come home, she called out to the helpless frightened sheep. Come home.

The minister called. "Just checking on my parishioners," he said. He sounded worried.

"We're all fine," she said.

"Good, good. You know, many people won't come to a minister because they think he's too busy or wouldn't understand or, well, lots of reasons, but I'm here to help. You understand that, don't you? I'm just here to help."

"How is the rummage sale coming?" she asked.

"Fine," he said, temporarily distracted, "although we could use more donations. It seems like everybody had his own garage sale this summer."

"I have a box. Things the kids have outgrown. I keep meaning to bring it down."

"Good, good." He seemed to remember what he had called for. "I'm always here, whatever the problem. Remember

GALILEO 43

that, will you?"

"I'll remember that," she said.

She went back to the couch and picked up her sewing. She did not look at it. She stared at the ugly macrame plant hanger and wished Baker would call. Tell me the truth, she would say to him, I can't do this for whales and playing cards. I have to call to somebody I care about, only everybody I care about comes racing to my side and ruins it. Tell me the truth so I can get these poor people home.

Baker did not call.

She stared blindly down at the sewing in her lap and tried to think of someone to call to. So who do I care about that doesn't care two pins for me? she thought. Who do I know that won't come, that won't even call, even when I really need him?

Baker still did not call.

She picked up the sewing, took the needle out of the fold, and began to take neat, even stitches.

Come home, she said, and the image was clear and steady as a lighthouse in her mind. I love you. Come home.

Dr. Borodrin and Dr. Michaels slept against the bunks, huddled together for warmth. Dr. Borodrin turned and whimpered in his sleep. Dr. Michaels shivered and moved closer to him for comfort. Her face looked infinitely troubled. Dr. Borodrin whimpered again, and it was a lost and frightened sound.

"How are they doing?" Baker asked.

"Still nothing. They think they're alive, though. Anyway, the console showed a readout. It didn't make any sense. It could have been a meteor hit."

"In which case they're dead."

"In which case we call our little housewife and tell her to stop."

"No," Baker said.

"She's wasting her time."

"If they did regress, they had four weeks of food they could get into. We've got two weeks left."

"I tell you, it's not working."

"Neither is anything else. There's no way we can get out to them in time."

"And a housewife sitting in her living room can?"

"Maybe."

"Well, anyway, call her and see how she's doing. Maybe she's given up altogether."

"No," Baker said.

**D**R. BORODRIN OPENED HIS EYES. He reached out for the ribcord spread beside him and then stopped and listened. The voice of the computer spoke in a slow patient tone that was almost painful. But the sound Dr. Borodrin cocked his head toward came from the corner of the bookcase. It was a low, disturbing sound. Dr. Borodrin pulled the bedspread up against his cheek and squeezed his eyes shut. The sound continued.

Dr. Borodrin dragged the bedspread with him over to the food cupboard. He kicked at the empty plastic pouches on the floor with his bare foot. One still contained food, a glutinous orangy stuff. He sucked the pouch clean and sat holding it and listening.

The ragged, quiet sound was very close. Dr. Borodrin pulled himself along the length of the bookcase, frowning, his head tilted to one side. He still held the sticky pouch. He

peeked around the corner of the bookcase and reached out the hand that held the pouch. He touched it to Dr. Michaels's shoulder.

Dr. Michaels did not look up. She was huddled against the wall, her knees drawn up against her chest, her arms hugged close to her stomach. She was crying. She did not cry out loud. The uneven sound came from the hiccuping intake of her breath.

Dr. Borodrin straightened up, leaned slightly back, and sat down hard. He put the plastic in his mouth and sucked loudly at it. He held it out to her shoulder again, his face puckering into distress and then into thought.

His expression changed. He frowned sharply at the pouch, and shook his hand free of it in distaste and surprise. He stood up and reached out firmly to grasp her shoulder.

"Sarah," he said. "Don't cry."

She ducked her head against her knees. "I wanna go home," she said, hiccuping the words. "I want my m-m-momma."

"Dr. Michaels," Dr. Borodrin said firmly, "Wake up."

Dr. Michaels looked up at the man bending over her. "Oh, Baker!" she said joyfully. Her eyes widened. "Oh, my."

Dr. Borodrin turned a uniform and vivid pink. Even the bald spot on the top of his bent head was rosy. "Ahem," he said, and straightened up. Dr. Michaels's eyes widened even further. He bent over her again. "Ahem," he said again, "something very unusual seems to have happened, Dr. Michaels. I do not know what, as yet."

The tears were drying on Dr. Michaels's cheeks. She looked around the littered cabin and then back at Dr. Borodrin. She made an odd sound, halfway between a giggle and a sob. "I think I do," she said.

Dr. Borodrin turned magenta.

Halloween night it snowed three feet. The buses didn't run, and parents who lived close in had to sleep extra kids for the night and then help the town shovel out. November third was the league meet. One of the judges and two of the teams couldn't make it through the still uncleared roads, but Don decided to hold it anyway.

For a whole week she was not home. From four to six she shovelled snow and filled in for the missing judge, marking down neat hashmarks like stitches for time deductions and superior tricks. Come home, she pleaded. I love you. Please come home. The image she had focused in on remained clear and steady. Please come home.

It was slightly warmer in the cabin. The computer's voice spaced its words distinctly, as if it were speaking to a child. "Put your hand on the big black square. See the lights. See the letters. Put your fingers on the letters. L...4...R..."

Dr. Borodrin stood facing the bunks. He was now a curious reddish-purple. Dr. Michaels faced the corner of the bookcase. She held her jumpsuit against her bosom and attempted clumsily to get into it without uncovering her breasts. When she had it on and zipped to her neck, she walked to the desk, carefully averting her eyes from the direction of the bunks.

Dr. Borodrin tossed the bedspread onto the bunk and pulled on his jumpsuit. He came to the desk and stood an embarrassed distance behind Dr. Michaels. She lit the keyboard and touched the appropriate letters of the code. Dr. Borodrin reached around to her left, being careful not to brush against her, and switched on the transmitter. He

walked back to the bunk and sat down in the heap of bedspread.

Dr. Michaels picked up the mike. "Hello," she said, again with that curious hiccuping giggle in her voice. "This is Dr. Michaels. We've had some...confusion here."

Able brought her a thick plastic-bound notebook. In it was a seventy-five-page report on the results of the artificially induced whale migration. "Congratulations," he said. "Thanks to you our whales are safely in home waters."

"And the buffalo is alive and well and living in Pierre."

"And the buffalo is alive and well and living in Pierre." Baker smiled at her. She smiled back.

"The American government wishes to thank you for your patriotic effort," Able said.

She was looking at Baker.

"You will receive a letter of commendation," Able said, "signed by the head of ocean studies. And of course our personal thanks for being our little lamp in the window."

She was still looking at Baker. Baker was smiling at her.

Able stood up. He nearly banged his head on the planter in its macrame holder. "Of course we realize how busy you are. We've intruded on your time enough already. The thanks of a grateful government are yours. How many people can say they've saved a whole species from extinction?"

She followed them to the door.

"I forgot to ask you," Baker said. "Did you find somebody to call to?"

"Yes," she said.

"Somebody who didn't come racing to you every time you did your thing?"

She looked at Baker steadily. "He didn't even call."

"I told you she had a—" Able started, and then stopped, looking annoyed.

"Anyway," she went on, smiling a little, "I couldn't have done anything about it anyway. I'm the gymnastics coach's wife, remember?"

"I remember," Baker said.

"The government of the United States of America—" Able began again.

"You got our ship back for us," Baker said.

"Were the people all right?"

"Yes."

"I'm glad."

Hundreds of dedicated housewives all over America performing their patriotic duty, all working together to bring those mighty ships, the whales, safely into port. And you were part of it."

"There was only you," Baker said.

"Not quite," she said, and smiled at him as if Able weren't even there.

**D**R. MICHAELS GRABBED another drink off the tray and went over to the corner where Baker was sitting.

"Where's Doctor Borodrin?" Baker asked.

"Has he figured out what happened yet?"

"No. He thinks now it has something to do with the effect of coriolis forces on the frozen brain cells. The old Puritan."

"All right," Baker said. "let's have it. Why is he an old...whatever he is?"

"Because he won't face facts. You probably know the disgraceful way we behaved on board in our blessed state of innocence. The rest of Houston does. But he acts like it never happened."

Connie Willis

"I thought you couldn't remember anything."

"I can't. But I can figure things out. I know what we were doing in that cabin with no clothes on. And so does he. So I said, look, we did it once, we might as well do it again. At least this time we could get some fun out of it."

"And he said?" Baker was grinning widely.

"He said I was too old to be talking like that and he thought the coriolis forces had done something to my libido. And I said...well...a lot of things about his libido. The old prude. Anyway, that isn't why I came over. Wait a minute," she said. "I want another drink."

She tottered after the retreating waiter, snagged another glass, and came back. "I have something important to tell you, Baker." She gulped at the glass. "I need some fortification first..."

"Don't tell me you were lustng after me up there, too," he said.

"No. This is important. I come to and I'm sitting in a corner stark naked and bawling like a baby and Sam Borodrin doesn't have a stitch on either and there we are."

"And?"

"Anyway, this great pink hulk behind me tells me not to cry and I wipe my nose and blubber out something about wanting to go home, and then our garden-of-Eden condition dawns on both of us and we scurry around like a couple of teenagers caught in the act." She took a deep breath and another gulp of champagne. "I was under a lot of strain, Baker. You've never seen a fifty-eight-year-old man blush all over like I have. I mean all over.

"Anyway, when I get it written down in very garbled form, the first thing I remember is this. I feel this terrible loneliness, like when my mother died, and there she is, standing on the brink of heaven with all these pink and gold clouds in this brown-print housedress she always wore. My God, how many years ago was it? I hadn't thought of that housedress in thirty years. But there she is, saying, 'Come home, come home,' and I'm so homesick I could die." She stopped. "What were you guys doing down here, anyway?"

Baker smiled. "Able's writing up the report." The waiter came past with more champagne. Baker handed a glass to Dr. Michaels.

"Anyway," she said, downing it in one hiccup, "my mother is you."

"Me?"

"Plain as day. In a brown housedress. Saying, 'I love you. Come home.'"

Baker leaned back thoughtfully. "I love you. Come home. Well, what do you know? She really said, 'I love you'?"

"You said it. You, my own mother. Come on now," she said, leaning breathily over him, "you can tell me. What were you guys using on us? Whatever it was produced this tremendous pull—no, that's not the right word."

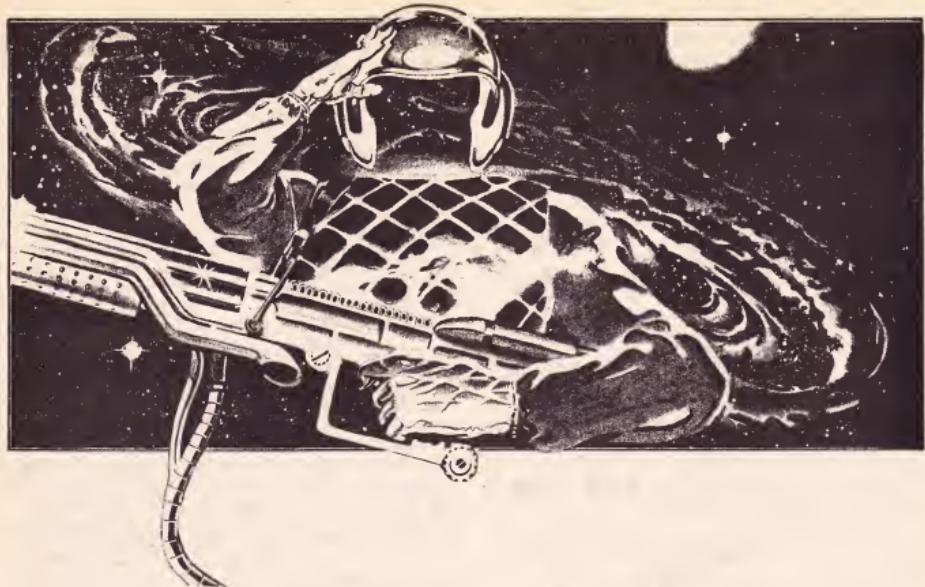
"Whales," Baker said. "We used whales. And the poor extinct buffalo."

Dr. Michaels looked suspicious, "Able said something about pigeons," she said.

"I wonder what would have happened if I had called her?" he said thoughtfully. "Nah, she isn't the type." He grinned at Dr. Michaels. "She really said, 'I love you,' huh?"

They both had another drink.

—G—



Fred Koechlin

# UNIVERSAL SOLDIER

D.C. Poyer

**W**

HAT ARE YOU?"

"I am an android, sir."

"What unit?"

"The 437th Mechanized Counterinsurgency Squad, sir."

"What is your designation?"

"Robert C. Rolfe, Private First Class, 187405289, sir."

"What is your condition of readiness, Rolfe 89?"

"Condition One, no malfunctions anticipated, fully armed, trained, and ready for combat, sir."

"How do you feel?"

"I do not feel anything, sir."

"Very good," said the officer. "Parade rest."

Rolfe snapped to parade rest, right arm out held steady just above the sling swivel of the M20, left behind his back, left boot stamping smartly into the dust. His eyes were level and focused on the horizon, which was jagged with the tops of dark green pine trees. He did not blink as the officer's cap brim tilted up at his face once more, and then down, and then moved on to the next trooper in line.

A human, Rolfe thought reverently. The short officer could have been nothing else. Even with his eyes fixed, Rolfe had seen the man's irregular, blotchy complexion, the hairs in his nostrils, the poor teeth, the raw smell. A human. The Variable Perfect, as opposed to himself, the Invariable

Perfect. He mused, one part of his mind hearing the officer say to the man next to him:

"What are you?"

"I am an android, sir."

"What unit?"

"The 437th Mechanized Counterinsurgency Squad, sir."

"What is your designation?"

"Robert C. Rolfe, Private, 187405265, sir."

"What is your condition of readiness, Rolfe 65?"

"Condition One, no malfunctions anticipated, fully armed, trained, and ready for combat, sir."

"Fine, fine. How do you feel today, Rolfe 65?"

"I do not feel anything, sir."

"Good looking unit, Sergeant," Rolfe heard the officer say. "Thank you, sir." That would be the Sarge. *Odd*, Rolfe thought, *how the Sarge sounds different; he's a Rolfe too, an older model.*

"At ease, you glory hounds," said the Sarge. Rolfe relaxed. He glanced around at his own face, mirrored above sweaty-collared olive drab, bent to a cigarette lighter, staring at the Sarge with full lips slightly parted and wide green eyes calm and cool under the anodized A-over-the-eagle insignia. *Android*, Rolfe thought, savoring the word. It was a title to be proud of.

"Listen up, troops. Here's the deal. We'll sleep in the APCs tonight—14, 76 take the first watch. Everyone check your weapons before you hit the sack. Reveille at 0330. Have a quick D-rat and be ready to move out at four. Tomorrow we'll wipe 'em out in their nests, the last of 'em!"

Rolfe smiled. He did not feel hate for the enemy, or pity. They had to die for the greater Perfection. *Ten-hut; right face; double time, march.*

Rolfe trotted toward the personnel carriers, his weapon at the trail, the faint smile still on his face and on the face of the twenty-eight others who trotted ahead and behind 187405289.

*Tomorrow, he thought exultantly.*

"*Rolfe!*" Someone hissed in darkness, and he was instantly awake. He knew where he was and what would happen that day. He reached up for the light switch but his hand closed on someone else's as the dim red night lights came on, painting the inside of the personnel carrier in black and ruby. He waited until two others—42 and 17 tattooed on their left cheeks—had wriggled out from the bunks below, then slid out of his own and folded it up into the side of the APC, against the aluminum armor. Stooping, he followed the others out the hatch and down the ramp, boots boooming hollowly on metal.

"Cut the racket, goddamnit," the Sarge whispered angrily. Rolfe blinked. It was very dark. Behind him even the dim red glow disappeared as the ramp was drawn up and the hatch closed again. He stood still until his android body automatically opened his pupils. The stars became brighter and he could make out vague dark shapes. They were squatting around a field microwave, heating the plastic cans of D-rations. He pulled a can from his pack and joined them.

"Time," whispered the Sarge. Rolfe gripped his weapon and peered into the darkness of the forest ahead. He glanced to left and right, seeing his buddies. They were crouching, just as he was. Number 11, he saw, was to his right. The whole line of Rolfes was crouched in just the same way and Rolfe smiled. *Even in combat, an android is never alone*, he thought.

"Move out. Stay fifty paces behind the point. Stay in line abreast. Stay alert and shoot on sight. And *keep quiet!*"

*Right, Sarge*, said Rolfe silently. He pushed off the safety and began to walk forward, keeping every android sense alert for the enemy.

Nine o'clock and already hot. The woods were thick; stands of second-growth pine, so close together that the soldiers had to edge through sideways; in the numerous ravines that furrowed the forest snarls of brush and thorn bushes barred all progress. Rolfe's shirt was soaked and the fat black flies had scarred his face and arms. He hadn't flinched. He had felt the pain but *androids*, he told himself proudly, *don't respond to pain.*

*Not like humans.*

From not far ahead, in the direction of a densely overgrown ravine, came a remote popping sound. *Small arms, rifles*, Rolfe thought. He felt his parasympathetic system respond, kicking his heart and breathing up to a higher rate, and felt proud; he was truly well trained and a good android; he hadn't even had to think about it.

"Come on, move your asses, you lazy SOBs!" The Sarge, shouting from behind. Rolfe looked around, then gripped his weapon and began to run, heavily, for he was tired, straight ahead, in the direction of the ravine. Several more shots

D.C. Poyer

sounded from ahead. Rolfe checked to see that the safety was off as he ran down a long slope into the undergrowth. He set the M20 on C and sliced away at the vegetation. Trails of ropy vines, small green branches fell glowing and hissing around him as he waved the pale-red beam through the undergrowth. He plunged down the length of the ravine, hearing the crashing progress of the others off to the left and right; they were taking the higher ground. Well, then, he'd clear out the ravine. He sliced on. Eddies of white woody smoke rose behind him and small fires flickered briefly in his steps.

"Hold it!"

Rolfe froze, then swivelled, caught the round pale face and frightened eye between two yellow-flowering bushes. The antique rifle crashed above him as he dropped and rolled, hearing the bullet strike a tree—*wchock*—and go *wum-wum-wumming* off into the woods. Rolfe completed the roll, brought up the M20 as the pale-faced man, stubble-cheeked, worked the lever frantically, and sent the C-beam slicing out and across the man's body. The man screamed, dropping the rifle and beating at the flames that burst from his clothes with his already-cooked hands. His eyes stayed fixed on Rolfe's.

Rolfe hesitated. *Take him prisoner?* Yet the Sarge had said *wipe 'em out, the last of 'em*. The enemy. He examined the man, dialing his M20 to K, where it should have been.

Deviant. Renegade. The distorted, pleading face told the whole story. Emotional. A reactionary, an Old Styler. Ragged, non-uniform clothes; meaning, no work niche. Human, yes, not android, but less than android: the Variable Imperfect. For which there was no place in the Perfect world. He raised the weapon.

"Don't!" groaned the man. He backed slowly against a foot-thick pine, holding out his charred hands as if in prayer. "Don't. How can you do this?"

"I'm an android," said Rolfe. His voice sounded strange to him, but he smiled proudly. "I do what is ordered."

"You're no android," said the man. "You're a clone. You're as human as I am, there's just several of you."

"I'm an android," said Rolfe.

"You're human," said the man insistently. His voice rose, as if he sensed a chance. "You think you're a robot because they raised you as one, trained you as one. Did you ever have a family?"

"The 437th Mechanized Counterinsurgency Squad, sir," said Rolfe.

"Artificial wombs," said the man. "Plastic phallus. Multiply and conquer. The great simplifications of science. Have you never had a mother, a father, a friend? Someone to tell you what you can be, what you really are?"

"Robert C. Rolfe, Private First Class, 187405289, sir."

"My God, don't you even know you're human? What have they done to you?" the man screamed.

"Condition One, no malfunctions anticipated, fully armed, trained, and ready for combat, sir."

"Can't you feel anything at all? Anger? Pity? Fear?" The man whispered, arms clutched protectively to his chest.

Rolfe aimed the weapon. Blue fire hissed and part of the man and a section of the tree behind him turned to char. The man fell in two halves. The pine toppled over and began to burn, the resin bubbling slowly with little popping and screeching tongues of yellow smoky flame.

"I do not feel anything, sir," Rolfe said. He smiled proudly. It was true. He did not feel a thing.

He was an android.

—G—

GALILEO 47

# JAHRATTA DKI

George Florance-Guthridge



'M A LEG MAN. I can repair an athlete's kneecap and have him back in a race before most other techs can pick up their needle-nosed pliers. That quickness makes me very important to the New Olympics. It keeps me well interviewed—and well paid.

Of the nine Games I've worked, the most memorable for me were back in '36. Held in southern Seattle, in what was once old Portland, they were my first Olympics; I suppose that's why I remember them so clearly.

But also I remember Jahratta Dki.

I'll never forget the eleven times he mounted that victory stand, to bow slightly and receive his medal. Then, as his flag raised and anthem played, he would lift his head, square his shoulders, and let the disc slowly turn him for all the crowd to see: the crowd of nearly a million who at first cheered and later booed him.

I first saw him during the opening procession. Coming from the underchambers beneath the stadium, the other techs and I were momentarily blinded by sunlight as we marched onto the track. The Seattle weathercontrollers had shut off the rain, and the stadium was hazy with that white daylight that sometimes settles over the Northwest after a summer storm. The crowd was a blur of amorphous faces. Trumpets and applause rang in my ears. A flight of white doves went winging across the sky.

At last the procession rounded the curve and I could see the athletes. One hundred and forty-two lean-muscled men and women, they were standing at parade rest at the far end of the field—their bionic eyes intense, faces calm yet resolute, shoulders pulled back and stomachs flat.

I felt aglow with pride. I knew some die-hard critics still considered the athletes to be mere machines. But to me they seemed more human than the people in the crowd.

I spotted America's male entry, a young black named Wilson Sinclair, standing behind a blond Dane. Wilson was



stockier than most, his close-cropped hair twisted into a dozen tiny braids, his synthe-flesh appearing waxy in the sunlight.

My gaze followed him as I continued to watch, and I nearly lost my place in the procession. I skip-stepped to get back into marching rhythm. Then a lithe, brown-skinned athlete at the end of the front row entered my vision. He had the stark features of a Punjabi, but at first I did not recognize the emblem on his jersey. The gold sun and four stars in a field of red were familiar enough; the dragon on his belly was not—it was a moment before I remembered that China's male entry came from the People's Province of Tibet.



His legs were spindly, and his hair was brushed back so tightly it seemed painted on. His skin looked as if someone had tried to burn the mold. But being a tech I was not deceived by externals: it is the bionic musculature which makes a cyborg what he is. Eager to have such men for their armies, governments of many countries could care less if a cyborg's cosmetology was second-rate.

There was something about the eyes... Perhaps it was only the sunlight, but they seemed to reflect some perseverance Sinclair did not possess. Strange how an athlete's mind can affect his circuitry. Suddenly, disheartened, I knew.

Jahrratta Dki would win the Games.

Dki entered the first event—the hundred meters—at a disadvantage. Placing fourth in his semi-final heat, he was given the outside lane in an eight-runner field. The middle lanes, which sprinters covet because they can see their competition, went to Sinclair and to a woman from the Australian Confederation.

Having the afternoon off, I was in the stands: no matter how quick-fingered a tech may be, he is less than useless in the shorter races. I focused mainly on Sinclair, my gaze riveted to the huge screens that hung suspended above the

midfield and thus afforded a clear view even to those of us in the stadium's uppermost tiers. But my attention kept shifting to the sinewy Tibetan in the lane nearest the wall, waving his hands in refusal when one of the officials, picking up a hammer, offered to help him pound in his starting blocks.

Dki took one practice start, then, not letting his spikes dig in, came walking back on his heels, wiping his hands on his satin trunks and frowning at the track. He picked up a stone and tossed it aside, shook his hands to loosen up, bounced up and down several times.

The starters called the runners to their marks. Late-deciding members of the crowd frantically punched buttons and received tickets from the slits in the tiers, and I found myself thankful I was not allowed to bet. My conscience would have demanded I bet on Sinclair; my wallet would have suggested otherwise.

"Set!"

The sprinters rose. The crowd hushed. I concentrated on the close-up screen. Nearly all runners would probably come within a tenth of a second of the record of 6.2 seconds, established by Quilla of West Brazil back in '28. Everyone expected a photo finish.

The gun popped.

Sinclair was the first off the blocks, a charging bull whose straining forehead muscles reflected the agony of the human brain within.

Then a slim figure glided past him, the legs moving with fluid grace, the face calm and serene, a wry smile on the lips. Dipping his head at the tape, Jahratta Dki won by four meters.

Sinclair took second.

The Australian reached the finish, and fell.

Moans and ticket stubs filled the air. Immediately in front of me a woman in a glittersuit began dancing in a circle, smiling and holding up a pair of blue tickets. I turned back to the screen.

The tape fluttering from his chest and onto the ground, Dki turned and trotted back to the Aussie—now standing, bent over, hands on knees. He touched her arm. Her gaze lifted, and for a moment they just looked at one another—she with the sunlight across her cheek; he standing with shoulders awkwardly hunched, like an adolescent embarrassed at having to ask for a date: two figures sheltered by their sense of one another from the noise of the crowd. Then she took his hand, and they jogged.

Sinclair joined them, taking the woman's other hand. They spoke quietly as they jogged, their strides smooth and in unison. None of them looked up into the stands.

"Five point nine five seconds," the loudspeaker boomed. The sprinters did not seem to notice. But the announcement made my breath catch in my throat, and I found myself gripping the chair-back of the next tier, the crowd's noise swelling to pandemonium. Five point nine five! As a tech I recognized the unbelievable single-mindedness necessary for an athlete to drive his machine body to that kind of performance. I wanted simultaneously to applaud and to cry out in frustration.

My thoughts were diverted by a man beside me, a SunCity-retired type with neatly trimmed sideburns and a gray feather in the band of his hat. He was leaning close to a friend, speaking gravely. Though I heard little of their conversation, one sentence made my blood run cold.

"Someone better recheck that skinny bastard's specs."

His words should not have bothered me. Yet I found myself sitting down, watching without interest as the joggers rounded the track.

I felt the first death-throe of my naivete.

For I had been thinking the same thing.



NEXT SAW DKI at the end of the longjump approach. I was on duty, carrying a folded stretcher and an emergency kit (one nice thing about field events: when an athlete is injured, you usually have time to take him downstairs), and had followed Sinclair over from the 200 meter competition—which Dki had won in fifteen seconds flat. The crowd parted before Sinclair with an expectant hush; I remember looking at Dki as I might a lovely young woman.

He stood bent-backed, arms dangling, peering down the coktopped approach. His pectoral muscles, visible where his jersey sagged beneath his armpits, were gaunt. Sunlight gleamed on his satin-covered rump.

Head down, fingers cupped and arms pulling almost in slow-motion, he started his run. Picking up speed, moving rhythmically, he slowly straightened. Now he was running upright, eyes slit, cheeks hollowed. Faster and faster—knees coming higher, higher, the strain evident on his face, a sense of energy seeming to tighten within him, coiling down, building. He hit the white jump board, driving down hard with his front foot, and then, in a single movement, a blending of speed, power, and coordination, he lifted himself into the air. Dki used neither the traditional "air-walk" nor the newer somersaulting method. Rather, he jumped in a style uniquely his own, knees tucked under and legs turned slightly to one side, his left hip thrown forward; it was not so much a leap as a sailing outward, an abnormal suspension you might see at a masterful ballet.

He landed, toes pointed, in a spray of sand, immediately bounded from the pit, and, sucking a breath, turned to watch the measuring crew. It was a long, long jump; already the onfield spectators were pushing forward, murmuring excitedly.

A crewman stuck a tongue depressor in the sand, the board judge squinted at the automatic, metallic-green distance recorder at the pit's front edge. I ran around to the far end of the pit and pushed through the crowd just in time to see the judge, open-mouthed, glance toward the crewman, then look down again at the recorder. "Thirteen point six zero meters," he said quietly.

I turned toward Dki, tried to speak. The words rasped in my throat. "Eighteen centimeters," I managed at last. "You broke Mose's record by eighteen—"

His face remained impassive, yet I thought I glimpsed behind those eyes a look of disdain—not arrogance, though; something closer to chagrin. His head lifted, and he no longer was gazing at me but beyond me—beyond the crowd, the stadium, the darkly mounded Willamette Hills. "Yes," he said. "I did." Then: "But it is not enough. Not nearly enough." With an air of sadness he turned and walked toward the arches that led to the stadium's underchambers.

I glanced toward Sinclair—doing stretching exercises in the grass alongside the far end of the approach—then back toward the darkness of the archway. It would be a few minutes before Sinclair had his turn to jump.

I followed Dki. Out of fear, mostly: fear that his specs did not conform, that somehow he had circumvented those Olympic safeguards I so youthfully trusted. But also out of curiosity. And awe.

The stadium (built for "traditional" sports events) was less than five years old, but already the underchamber corridors—ascrav with graffiti and littered with cigarettes, program booklets, odds sheets—stunk of urine and beer. I hated having to walk through the corridor to the labs. The place sickened me—almost literally, certainly in spirit. It reaffirmed my distaste for humanity; reaffirmed my love of the cyborgs.

"Why do you stalk me?" a voice asked.

I turned to see Dki standing in a corner, arms crossed, staring at me through those dark, penetrating eyes. Sharded by shadow, he appeared even thinner than he really was.

"I was not stalk—" I stifled my anger. Such a small thing, his rebuke; it hurt because it was on target. I stepped toward him, and though he did not move nor his gaze change, he seemed to draw away with a certain fear. "You take such little pride in your victories," I said. I gestured toward the field. "None of the other athletes will come close to your mark, yet you act as if that meant nothing. It's as though you wished to slough off your accomplishments."

I stood with hands on hips, trembling with the frustration of a hundred sleepless nights prior to the Games, Sinclair laid out on the table and the lights bright overhead as like worker ants we techs scurried to test and refine circuits and sometimes even remove limbs while somewhere within that metal and wire his human brain blissfully slept.

"I just don't understand you," I said suddenly.

It was a ludicrous thing to say, given the differences between us. Immediately I regretted having spoken. I waited for him to laugh.

He did not laugh. He wheeled and walked away.

A spear of sunlight lit up the main part of the corridor, and he stopped where the tip touched the far wall. "How can anyone understand when I myself hardly do?" he said softly, not turning.

I crossed the corridor. His shoulders were sagged; a sense of despair had settled about him. "Back in Tibet," he said, continuing to face the wall, "are other Dkis—earlier models: ancestral Dkis which did not measure up and yet were too valuable for study simply to be discarded. There I stand: row upon row of myself frozen in little cubicles."

When he turned, his eyes registered a despair I did not know a bionic athlete was capable of feeling, much less of showing. "Can I revere them, my ancestors? Revere myself? —knowing that by scientific standards I am better?" He took hold of my shoulders, but I realized he was talking to himself, that I was only a sounding board. "Can I worship the half dead, the frozen imperfect?"

Again despair swept across his face—a deepening in the eyes, the cheeks almost imperceptibly hardening with emotion. He seemed to become cognizant of me, and the despair darkened to hatred. "You follow me to question my accomplishments. But why should I answer? You're like the rest of the techs. You work for *art*"—he spat out the word—"as though by your pinching and probing you can transcend the world's ugliness.

"Well, look at my ancestors," he went on. "Imperfect models, you call them. Models! Where's your art then, creator? Where's your transcendence? That's why I'm going beyond, shattering the capabilities people like you have supposedly built into me, so that you will blink and ask, 'We created something that perfect?' Yet in your hearts you'll know Dki is better than you thought possible. You hear me?" He shook me lightly by the shoulders, and I was so stunned by his vehemence I went limp, puppet-like. "Better! And only then will the truth become clear: if Dki is so much better than your expectations, then so must have been all those Dkis before: those you silently scoffed and cursed and shelved like broken dolls. Better than you! Better than your combined efforts!"

He left me, then. Spikes clacking on the concrete, he disappeared into the dark recesses of the corridors. I stood slack-limbed, my heart beating thickly in my throat, knowing I had heard more than I had wished to, sensing I had encountered only a small part of his anger and his terrible despair.

**B**ESESIDE THE USUAL personnel clearance, in the New Games there are basically two safeguards against cheating (that scourge which eventually had caused the downfall of the Olympics of the last century). First, prior to the Games each athlete's specs are thoroughly checked, and the main neuristor terminal is

sealed. Rather than the specs being rechecked before each event—an operation involving several hours of lab time—the judges merely check the seal: a bit of molybdenum alloy just beneath the skin, at the base of the skull. Dki's was always intact.

Secondly, and far more importantly, is the fact that a cyborg normally functions not as an athlete but as a soldier. For a cyborg to be caught cheating would imply that he must be inferior to his counterparts: a blow to national pride—and defense.

It was thus a major news item when, after the longjump, the Olympic Committee checked and rechecked Jahratta Dki. They tested his circuits, examined his neuristors, traced his wiring—and pronounced him fit for the Games. The spectators were appeased. Some suggested that Dki was too great an athlete for fair competition and interesting odds; but it was a suggestion based on admiration, not animosity.

He continued to win, and handily—not just breaking records, but shattering them: the highjump by five centimeters, the discus by thirty, the 50-meter butterfly by two seconds. Though the margin of his record performances decreased with each victory, he continued to defeat the other athletes by about the same ratio as in the early events. They, too, were firing.

Then, after the bicycling competition—one of the events Dki did not enter—the scandal broke. Spurred, he said, by a sense of guilt, a Latin American official entered the office of the Olympic Committee and informed the members he had been bribed—that he had been persuaded to steal a terminal-seal.

"That seal is now installed in the neck of Jahratta Dki," he said. "Not the Dki you so carefully checked, my friends. But a flesh-and-blood athlete who has managed, just before each lab-checking, to switch places with his cyborg-twin."

The members scoffed but naturally had to investigate. They summoned the Chinese officials "for consultation." No one answered the summons. They summoned Dki. He was nowhere to be found. Finally, murmuring and frowning, they went down to the stadium's underchambers. Circumventing the voice-lock, they broke into the Chinese lab.

Slouched with one leg over the armrest of an easy chair was a cyborg named Jahratta Dki. Otherwise the place was empty. No equipment. No white-coated techs shocked by the intrusion.

"Gentlemen," he said, and smiled. "You have discovered our little falsehood."

Of course, no one actually believed the real Dki was human: it was commonly agreed that the matter simply involved twin cyborgs—though we could not understand why China had exposed itself to such ridicule. We should have been more suspicious. It was all too easy, the confessions too convenient. Yet we wanted to believe. I can see that, now. We wanted to throw another god off Olympus. Or off the Himalayas: whichever the case may be.

Then came the 10,000 meters. I was on duty in the midfield, trembling with excitement, my gaze darting from Sinclair to the other athletes and back again. In distance races, a tech capable of doing on-the-spot repairs can sometimes mean the difference between a win and a loss; he may not be able to get an athlete back in the race soon enough to place, but at least the athlete can finish—which gives him points toward the overall championship. Thus, it is not just a tech's knowledge that counts: it is also his quickness and willingness to take operational shortcuts. In a word, my cup of tea.

I had good reason to be nervous. A favorite but not the favorite in the event, Sinclair was only two medals behind Manuel Peis, from the Andesian Republic. (Naturally, Dki's medals had been revoked.) And Peis was weak in the distances.

I shall not dwell on the race. Suffice it to say that I stalked

along the edge of the track the whole time, one hand on my field kit and the other shielding my eyes, while the runners circled. The Kenyan-Ugandan, Naijio Buski, was the first to hit the tape. Sinclair, edged in the stretch by the Russian woman, took third.

Dki won.

Perhaps we should have stopped him; certainly we could have. But when, just after the gun sounded, we saw him—framed by the sun—stand poised on the bleacher rim as he shed his warm-up jacket, then leap down to land crouched upon the track, he seemed so desperate to make up the sixty meters separating him from the others that we left him alone. Running not beautifully but in pain—the earlier competitions, having taken their toll—he kept to the outer lane. It was almost anticlimactic when he passed Buski on the final curve, ducked under the tape (the end judges too dumbfounded to lift it), and disappeared into the nearest archway. I stood in the midfield, hating him for his deception and arrogance, loving him for the bionics he must contain, ashamed and awed, listening to the boos and watching the paper cups rain down.

Something snapped within me. Some fiber, for I realized that, regardless of the scandal, the situation would remain the same: here, we were—the spectators and techs; and there, the athletes. The railing in front of the bleachers and the concrete gutter around the inside of the track were more powerful symbols than I had ever dared admit. No matter how hard I worked on Sinclair, no matter how many operational shortcuts I perfected, I was just a kitten nuzzling a master's legs. Never would I become the athlete, not even for an instant; I was only deluding myself—innocently so, but still deluding. Never would I don that synthe-skin and wear it as my own.

That's what hurt me, standing there: the same hurt I had felt but not understood that day in the underchamber corridor. It was the separateness. The inequality.

The loneliness.



OR YEARS SOCIOLOGISTS and psychologists have researched and analyzed the New Olympics, trying to describe what sort of person enjoys watching machine-men compete against each other. Millions of demographic bits have been lumped, grouped, catalogued; still, no theorist has produced a definite profile—though many think they have. However, from such studies we know that spectators fall into one or more of three general types:

—the patriot. Since each country enters only two athletes, the spectator's loyalties are concentrated. Further, the Games are loosely analogous to Medieval winner-take-the-city combats; members of underdeveloped countries (whose governments exchange military and trade concessions for bionic materials and techs) are thus especially interested, since hypothetically a country with a population of one can amass enough points to win.

—the humanist. The human athlete pits his entire body against an opponent; in a certain sense, however, the cyborgs pit only their minds, since their bodies are basically equal. It is not surprising that during the Melbourne Games of '28 a sportscaster had dubbed the event "A Games in which machines compete as men, rather than vice versa."

—the armchair athlete. If a spectator realistically compares himself to a great athlete, he is almost certain to find himself woefully inadequate, especially if he confuses the field of sports with the field of life. With the cyborg he runs no such risk, for the spectator can reassure himself the athlete is "just a machine."

In the '36 Olympics we had a fourth demo-type: the worshipper.

Dki became a cult figure. Refusing to believe him to be a cyborg, some people elevated him to godhood. People too conceited to idolize anyone but a superbeing, people seeking

a divinely inspired comrade revolutionary or a scapegoat or just a Famous Friend—all were siphoned, chanting and ranting, into Seattle. They came on foot, in decrepit skybuses, in ancient automobiles. They opened shops and their mouths and sometimes, knife blades gleaming, each other; they sold trinkets and easy dreams and themselves.

Some said he was Buddha; Mao; an Athenian athlete who, having been transmigrated and resurrected by Himalayan rituals would collapse and die at the finish of the marathon—taking with him if not the world then at least all of its horrible others. Others, scorning mysticism, preferred the truth of pseudoscience. They said Dki was a voyager from another dimension; or, noting the recent sputtering radio signals from Arcturus, that he simply was from Out There.

They came. At night their fires dotted the Willamette Hills. They waited.

Historians have written that we Americans revere pain—that as inheritors of the Protestant Ethic we make the Medieval flagellants look like old women with plastic back-scratchers. Once, I laughed at the idea. No more.

Witness the 2036 Marathon.

It is not enough that the marathon is twenty-six miles long—and that it is the Olympics' final event, when the athlete's mind, seared by pain, effort, anxiety, cries out for a return to its former, mortal body. Not enough that the mind becomes unable to distinguish thought from pain, so that after a few miles each footstep no longer represents so much a movement forward as a masochistic willingness for everlasting agony.

No, those things are not enough. In America, marathons must be run up and down hills.

And it was run in the rain. "A marathon must be realistic," the members of the Olympic Committee decided at the last moment, and they ordered the weathercontrol shut down. Perhaps they did not know that rain makes it difficult for a runner to breathe. Or that it films over a cyborg's syntheflesh and blocks his tactile sensation.

I have a feeling that they knew.

Caught unprepared, we did what we could for Sinclair. We raised his tactile-sense levels and opened the oxygen-intake valves as far as specs would allow. We gave him encouragement and advice.

Which is to say, we could do almost nothing beyond the usual.

A little platform-cart staffed by two techs is permitted to follow each athlete. However, I was to remain at the finish and help out should an accident befall Sinclair as he struggled toward the tape. I remember standing in my green slicker before the race started, water dripping off me and my shoes already wet, thinking that no matter how many techs might come to an athlete's aid, we were little more than smiling clowns hoping to break the trapeze artist's fall as best we could.

The track was already puddled when the gun sounded. The runners jockeyed for position as they rounded the curve, splashed down the backstretch, took the second curve, and filed out of the stadium tunnel. Rain was trickling down my nose and across my cheek—the sky a gray slab so low it nearly roofed the stadium. I watched the members of the crowd sit down one by one, huddling beneath umbrellas, their bets locked in beside them. This race, I felt a kinship with the crowd, a kinship I resented: I had contacted a friend who ran a "private betting establishment," and I was angry at my lack of integrity. I had bet every penny I owned or could borrow. On Dki. And hedged that bet with a smaller one on Sinclair, in case Dki did not or could not run.

The last of the runners went through the tunnel.

The last of the umbrellas sat down.

When the announcement came over the loudspeaker that Dki had joined the race, I fought to control my excitement. My

heart began to pound. I tilted my head back and looked up—rain slashing against my face—just as the overhead screen blipped on. He was moving toward the rear of the pack. A sidelong camera-shot showed a bald youth, his naked chest painted with a silver X and his hands cupped against his mouth, step out from the crowd and shout something at Dki, his face flushed with anticipation. The camera panned for a hillside shot. The area was awash with people mobbing toward the marathon course, the red banners of the Neo-Maoists unfurled and flapping in the rain.

I have never found out if it was the presence of those cultists or the last-second intervention of Korea, Ranga-Mongolia, and the Triad of Southeast Asia that persuaded the Olympic Committee to let Dki continue. Probably it was both.

But continue he did—moving doggedly past one runner after another, his chin low and cheeks sucked inward, the muscles in his wiry arms increasingly prominent, his legs lifting, lifting, churning ever forward. No longer possessing the fluidity of motion he had shown in the early races, he ran awkwardly—elbows too far from his torso, hands too tightly fisted. Yet he ran with persistence; and because of that, with beauty.

"Dki is moving up on the leader, the American—Wilson Sinclair," the announcer said. The crowd began to boo and moan, and I could feel an ugly anger pervade the stadium. I looked up to see Sinclair, startled, glance sideways as Dki came up shoulder to shoulder. Now both athletes were matching stride for stride, arms swinging in unison. Sinclair stopped looking at the runner beside him and stared straight ahead, his eyes glimmering and the synthetic muscles in his neck straining as he fought to hold the pace.

Suddenly, arms surging, Dki was beyond Sinclair, his eyes seeming to sink into his skull as he crested Palantine Hill and started down. His lead slowly increased by ten, twenty-five, forty meters; now he was running against the clock, and thus only against himself.

"Two minutes, fifty-five point six seconds," the loudspeaker said. "Another sub three-minute mile. Dki has reached the halfway point and still has not slackened his incredible pace."

Even before I heard the announcement I had realized Dki's goal.

He was trying to run an eighty-minute marathon; trying to grasp a dream biologically equivalent to a human athlete's two-hour marathon, which no man had ever succeeded in doing.

Dki's running grew more laborious as he ran along Lake Oswego's north shore. By the time he reached the top of the Willamette Hills and began his descent homeward, his style had changed from persistent to ragged. His feet slapped the pavement of the old auto roadway down which the route serpentine. His cheeks looked like wet leather and his hair clung to his head in lank strands.

He entered the stadium—not running; staggering. I saw him slam against the tunnel wall and stumble onward, emerging again into the driving rain, his mouth opening and closing, his eyes shut in torment. Members of the crowd rushed to the railing; I glanced up, suddenly so frightened by the anger in their faces that I was unable to little more than stagger forward myself. A man in a blue jacket leaned over the rail. "You see that, you son of a bitch?" he screamed at Dki while waving a fistful of tickets. "My man didn't even place in the longjump because of you!" The tickets flurried down.

I was now beside the track. Dki reeled toward me, paused, finally managed to turn himself toward the finish line, like a drunken old soldier determined to remain upright until he reached his cot. The calm, serene face had been displaced by one contorted with terrible exertion. His eyes were glazed, his cheeks hollow and yellowish, his lips straining forward as though to pull him along.

George Florance-Guthridge

He wavered, reeled, lurched on a few steps. I wanted to leap onto the track, hold him up by the shoulders. But to touch him even briefly would mean the instant loss of whatever victory he still might obtain—he was beyond the eighty-minute barrier, yet that time now seemed a triviality compared to the enormity of his effort. I glanced around, hoping that out of somewhere—somewhere!—would come one of the Chinese techs. A brief desperation over my possible loss of money flared within me, then died, and I was glad it did. I felt desperate only for Dki.

He staggered sideways through a puddle, his head lolling on a scarecrow frame. The taunts and jeers grew louder. The railing became lined with people; paper, paper cups, program booklets flew down. The man in the blue jacket ran along behind some other people, climbed onto the rail and threw his shoe; it bounced off Dki's back, and he looked up toward the crowd. Then he turned again toward the finish—no tape this time; though the Committee members had allowed him to run in the marathon, they intended to deny him the satisfaction of winning.

His eyes rolled backward. He collapsed onto his knees and toppled backward. The finish was fifty meters away.

He began to crawl. I grabbed my tools and ran to his side. He moved a couple of meters before he suddenly stopped, his right arm outstretched, fingers stiffly reaching. Officials and other techs came rushing over. Several of them began waving their arms, trying to control the crowd.

I set down my bag—set down the useless tools. The last of my naivete snapped, and a sense of defeatism rolled through me. For he was not, we now saw, a cyborg. But neither was he an ordinary human: the slight waxiness of his skin was not just makeup to help him carry off the earlier deception. I felt his pulse, dropped to my knees and listened to his heart.

His eyes blinked open. His mouth worked, the tongue moving along parched lips. Yet even before he spoke I saw how we had all been duped by a carefully wrought plan whose only flaw was that its principal player was dying. A plan designed to dramatize the military superiority of a superpower in a world where weapons are not just symbols of destruction but also of national pride.

"Genetic engineering," he hoarsely whispered.

Eyes rolling upward, he gazed toward the finish. Then slowly his hand closed into a loose fist. That old, wry smile came again to his lips. Perhaps he realized that by dying he would bring his creators as much consternation as he would by winning.

I hope that is what he realized, in that final moment. But I do not know. I just do not know.

I sometimes wonder if it is a tribute to the New Olympics—or to the various superpowers—when I say that the Games survived. Through threats, bribes, and propaganda those powers not only placated the millions of people who had lost money in the '36 Games, but they also managed to interest people in the next Olympics. By 2044—two Games later—cyborgs were competing against genetically engineered humans in nearly all events, a gimmick that shored up whatever cracks had formed in the Games' foundation.

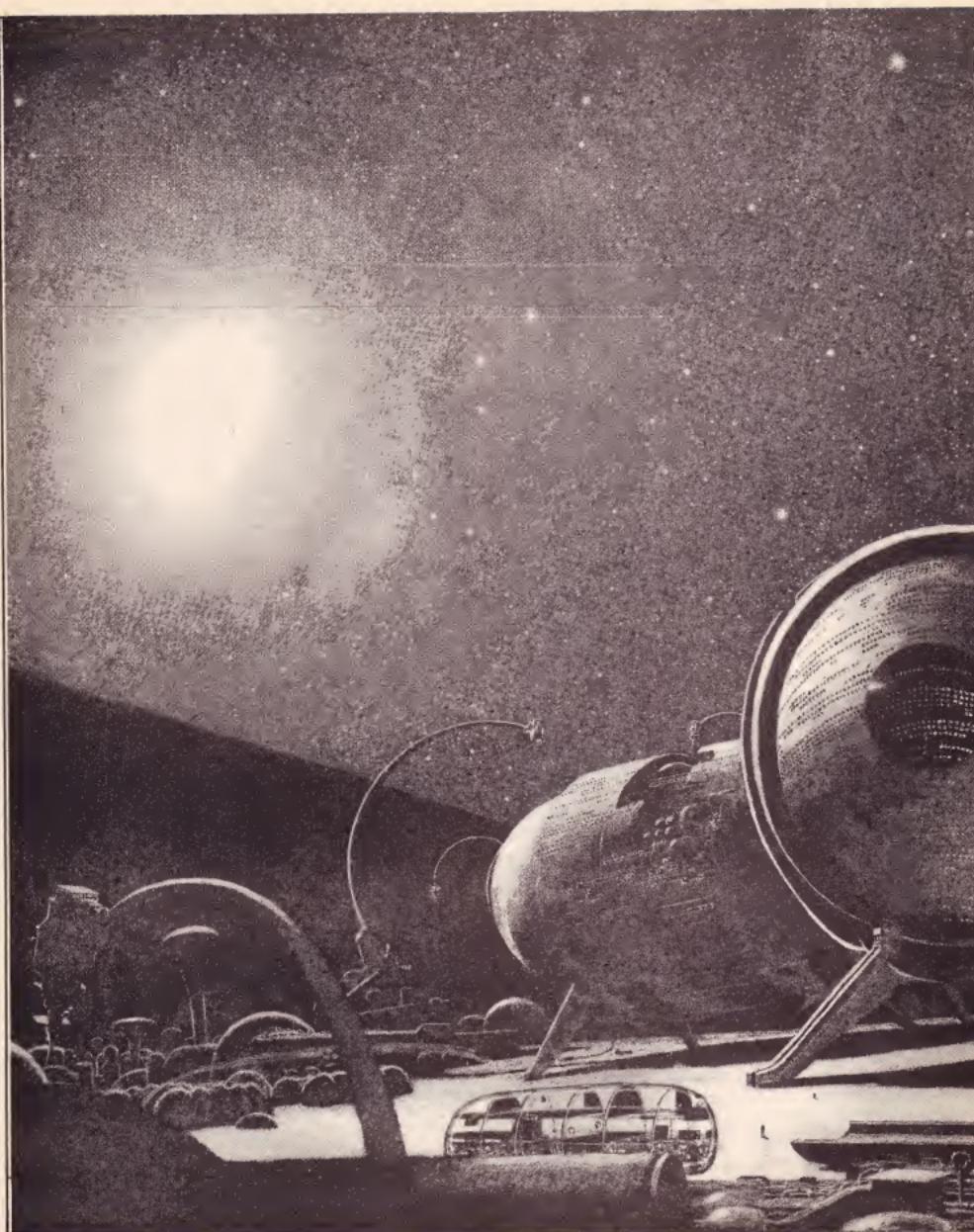
Still, there were victims. Dki, for one. And like I said before, I'm a tech for the fame—and for money, I still love the cyborgs; love them as I always did. Except now I love the cyborgs in spite of the Games, not because of them.

There was another victim as well.

Eighty-minute marathons are now commonplace.

And so we go on—the wounded, the sick at heart, the cynical—always the spectators, never the sprinters; afraid to run the race ourselves, lest the world pass us by too easily, and we falter, or even fall.

—G—





# THE RINGWORLD ENGINEERS

Larry Niven

## Part One

### DEDICATION

*Ringworld is nine years old; and I have never stopped getting letters about it. People have been reading Ringworld, and commenting on the assumptions, overt and hidden, and the mathematics and the ecology and the philosophical implications, precisely as if it were a proposed engineering project and they were being paid for the work.*

*A man in Washington, D.C. sent me a full proofreading job on the first edition of Ringworld, with the title "The Niven-McArthur Papers, Vol. I." It was of enormous help to me. (If you own a first paperback edition of Ringworld, it's the one with the mistakes in it. It's worth money.)*

*A Florida high school class determined the need for the spillpipe system.*

*From a Cambridge professor came an estimate for the minimum tensile strength of scrith.*

*Freeman Dyson (Freeman Dyson!) has no trouble believing in the Ringworld (!), but can't see why the engineers wouldn't have built a lot of little ones instead. Wouldn't it be safer? I hope the answer I've given in this book is satisfactory.*

*Of course there are no petrochemicals on the Ringworld. Frank Gasperik pointed out that any civilization at our level*

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Larry Blamire

would be based on alcohol. The Machine people would be able to use the vegetable sludge for other purposes, up to and including a plastics industry.

I was making a speech in Boston when someone in the audience pointed out that, mathematically, the Ringworld can be treated as a suspension bridge with no endpoints. Simple in concept; harder to build.

From all directions came news of the need for attitude jets; but it took Stein and Dan Alderson, working independently, several years to give me a quantitative analysis of the instability. Stein also worked out data on moving the Ringworld.

Dan Alderson was kind enough to work out the parameters for the Ringworld meteor defense for me—and that was the only piece of information I actually solicited.

You who did all that work and wrote all those letters: be warned that this book would not exist without your unsolicited help. I hadn't the slightest intention of writing a sequel to Ringworld. I dedicate this book to you.

## UNDER THE WIRE



OUIS WU WAS UNDER THE WIRE when two men came to invade his privacy.

He was in full lotus position in the lush yellow indoor grass carpet. His smile was blissful, dreamy. The apartment was small, just one big room. He could see both doors. But, lost in the joy that only a wirehead knows, he never saw them arrive. Suddenly they were there: two pale youths, both over seven feet tall, studying Louis with contemptuous smiles. One snorted and dropped something weapon-shaped in his pocket. They were stepping forward as Louis stood up.

It wasn't only the happy smile that fooled them. It was the fist-sized droud that protruded like a black plastic cancer from the crown of Louis Wu's head. They were dealing with a current addict, and they knew what to expect. For years the man must have had no thought but for the wire trickling current into the pleasure center of his brain. He would be near starvation from self-neglect. He was small, a foot and a half shorter than either of the invaders. He—

As they reached for him Louis bent far sideways, for balance, and kicked once, twice, thrice. One of the invaders was down, curled around himself and not breathing, before the other found the wit to back away.

Louis came after him.

What held the youth half-paralyzed was the abstracted bliss with which Louis came to kill him. Too late, he reached for the stunner he'd pocketed. Louis kicked it out of his hand. He ducked a massive fist and kicked at kneecap, kneecap (the pale giant stopped moving), groin, heart (the giant bent far forward, with a whistling scream), throat (the scream stopped suddenly).

The other invader was on hands and knees, breathing in sips. Louis chopped at his neck, twice.

The invaders lay still in the lush yellow grass.

Louis Wu went to lock his door. At no time had the blissful smile left his face, and it did not change when he found his door fully locked and alarmed. He checked the door to the balcony: bolted and alarmed.

How in the world had they gotten in?

Bemused, he settled where he was, in lotus position, and did not move again for over an hour.

Presently a timer clicked and switched off the droud.

Current addiction is the youngest of mankind's sins. At some time in their histories, most of the cultures of human space have seen the habit as a major scourge. It takes users from the labor market and leaves them to die of self-neglect.

\* Times change. Generations later these same cultures usually see current addiction as a mixed blessing. Older

sins—alcoholism and drug addiction and compulsive gambling—cannot compete. People who can be hooked by drugs are happier with the wire. They take longer to die, and they tend not to have children.

It costs almost nothing. An ecstasy peddler can raise the price of the operation, but for what? The user isn't a wirehead until the wire has been embedded in the pleasure center of his brain. Then the peddler has no hold over him, for he gets his kicks from house current.

And the joy comes pure, with no overtones and no hangover.

So that by Louis Wu's time, those who could be enslaved by the wire or by any lesser means of self-destruction, had been breeding themselves out of the human race for eight hundred years.

Today there are even devices that can tickle a victim's pleasure center from a distance. Tasps are illegal on most worlds, and expensive to make, but they are used. (A dour stranger wanders past, rage or misery written in the sour lines of his face. From behind a tree you make his day. *Plink!* His face lights up. For a moment he's got no worries at all.) They don't generally ruin lives. Most people can take it.

The timer clicked and switched off the droud.

Louis seemed to sag in upon himself. He reached across his smooth scalp to the base of the long black braid, and pulled the droud from its socket beneath the hair. He held it in his hand, considering; then, as always, he dropped it into a drawer and locked it. The drawer disappeared. The desk, which seemed a massive wooden antique, was actually paper-thin hullmetal, with endless room for secret compartments.

It was always a temptation to reset the timer. He'd done it routinely in the early years of his addiction. Neglect had made of him a skeletal rag doll, constantly dirty. Finally he had gathered what remained of his ancient dogged determination, and he had built a timer that took twenty minutes of nitpicking concentration to reset. On its present setting it would give him fifteen hours of current and twelve hours for sleep and what he called maintenance.

The corpses were still there. Louis had no idea what to do about that. If he'd called the police immediately, it would still have attracted unwanted attention—but what could he tell them now, an hour and a half late? that he'd been knocked unconscious? They'd want to deep-radar his head for fractures!

This he knew: in the black depression that always followed his time under the wire, he simply couldn't make decisions. He followed his maintenance routine like a robot. Even his dinner was preprogrammed.

He drank a full glass of water. He set the kitchen. He went to the bathroom. He did ten minutes of exercise, pushing himself hard, fighting depression with exhaustion. He avoided looking at the stiffening corpses. Dinner was ready when he finished. He ate without tasting, and remembered that once he had eaten and exercised and made every move with the droud set in his skull, delivering a tenth of normal current to the pleasure center. For a time he had lived with a woman who was also a wirehead. They had made love under the wire—and played war games and held gun contests—until she had lost interest in everything but the current itself. By then Louis had regained enough of his natural caution to flee Earth.

He thought now that it would be easier to flee this world than to dispose of two large, conspicuous corpses. But if he were already being watched?

They didn't look like ARM agents. Large, soft in the muscle, pale from a sunlight more orange than yellow, they were certainly low-grade types, probably Canyontes. They hadn't fought like ARMs, but they had bypassed his alarms. These men could be ARM hirelings, with friends waiting.

THE RINGWORLD ENGINEERS

Louis Wu disarmed his balcony door and stepped out.

Canyon does not quite follow the usual rules for planets.

The planet is not much bigger than Mars. Until a few hundred years ago its atmosphere was just dense enough to support photosynthesis-using plants. The air held oxygen, but was too thin for human or kzinti life. The native life was as primitive and hardy as lichen. Animals had never developed all.

But there were magnetic monopoles in the cometary halo around Canyon's orange-yellow sun, and radioactives on the planet itself. The Kzinti Empire swallowed the planet and staffed it with the aid of domes and compressors. They called it Warhead, for its proximity to the unconquered Pierin worlds.

A thousand years later the expanding Kzinti Empire met human space.

The Man-Kzin Wars were long over when Louis Wu was born. Men won them all. The kzinti have always had a tendency to attack before they are quite ready. Civilization on Canyon is a legacy from the Third Man-Kzin War, when the human world, Wunderland, developed a taste for esoteric weapons.

The Wunderland Treatymaker was used only once. It was a gigantic version of what is commonly a mining tool: a disintegrator that fires a beam to suppress the charge on the electron. Where disintegrator beam falls, solid matter is rendered suddenly and violently positive. It tears itself into a fog of monatomic particles.

Wunderland built, and transported into Warhead system, an enormous disintegrator firing in parallel with a similar beam to suppress the charge on the proton.

The two beams touched down thirty miles apart on Canyon's surface. Rock and kzinti factories and housing spewed away as dust, and a solid bar of lightning flowed between the two points. The weapon chewed twelve miles deep into the planet, exposing magma throughout a region the size and shape of Baja California on Earth, and running roughly east and west. The kzinti industrial complex vanished. The few domes protected by stasis fields were swallowed by magma—magma which welled higher in the center of the great gash before the rock congealed.

The eventual result was a sea surrounded by sheer cliffs many miles high, surrounding in turn a long, narrow island.

Other human worlds may doubt that the Wunderland Treatymaker ended the War. The Kzinti Patriarchy is not normally terrified by sheer magnitude. Wunderlanders have no such doubts.

Warhead was annexed after the Third Man-Kzin War, and became Canyon. Canyon's native life suffered, of course, from the gigatons of dust that dropped on its surface, and from the loss of water that precipitated within the Canyon itself to form the sea. In the Canyon there is comfortable air pressure and a thriving pocket-sized civilization.

Louis Wu's apartment was twelve stories up the side of the north face of the Canyon. Night shadowed the Canyon floor as he stepped outside, but the southern face still glowed with daylight. Hanging gardens of native lichen dripped from the rim. Old elevators were silver threads standing miles high against the cut stone. Transfer booths had made these obsolete for travel, but tourists still used them, for the view.

The balcony overlooked the belt of parkland that ran down the center of the island. The vegetation had the wild look of a kzinti hunting park, with pink and orange blended into the imported terrestrial biosphere. Kzinti life was common throughout the Canyon.

There were as many kzinti as human tourists down there. The kzinti males looked like fat orange cats walking on their hind legs—almost. But their ears flared like pink Chinese parasols, and their tails were nude and pink, and their straight legs and big hands marked them as toolmakers. They

stood eight feet tall, and though they scrupulously avoided bumping human tourists, carefully-tended claws slid out above black fingertips if a human passed too close. Reflex. Maybe.

Sometimes Louis wondered what impulse brought them back to a world once theirs. Some might have ancestors here, alive in frozen time in the domes buried beneath this lava island. One day they'd have to be dug up.

There were so many things he hadn't done on Canyon, because the wire was always calling. Men and kzinti had climbed those sheer cliffs for sport, in the low gravity.

Well, he would have one last chance to try that. It was one of his three routes out. The second was the elevators. The third, a transfer booth to the Lichen Gardens. He'd never seen them.

Then overland in a pressure suit light enough to fold into a large briefcase.

On the surface of Canyon there were mines, and there was a large indifferently-tended preserve for the surviving varieties of Canyon lichen. But most of the world was barren moonscape. A careful man could land a spacecraft undetected, and hide it where only a deep-radar search would find it. A careful man had. For these past nineteen years Louis Wu's ship had been waiting, hidden in a cave in the northward-facing cliff of a mountain of low-grade metal ore: a hole hidden within permanent shadow on Canyon's airless surface.

Transfer booths or elevators or cliff climbing. Let Louis Wu get to the surface and he was home free. But the ARM could be watching all three exits.

Or he could be playing paranoid games with himself. How could Earth's police force have found him? He had changed his face, his hair style, his way of life. The things he loved best were just the things he had given up. He used a bed instead of sleeping plates, he avoided cheese as if it were spoiled milk, and his apartment was furnished with mass-produced retracts. The only clothes he owned were of expensive natural fiber with no optical effects at all.

He had left Earth as an emaciated and dreamy-eyed wirehead. Since then he had forced a rational diet on himself; he had tortured himself with exercise and a weekly course in martial arts (mildly illegal, and the local police would register him if they caught him—but not as Louis Wu). Until today he was an adequate facsimile of glowing health, with the hard muscles a younger Louis Wu had never bothered to attain. How could the ARM recognize him?

And how had they got in? No common burglar could have passed Louis's alarms.

They lay dead in the grass, and soon the smell would overpower the air conditioning. Now, a bit late, he felt the shame of the mookiller. But they had invaded his territory, and there is no guilt under the wire. Even pain is an overtone to joy, and joy—like the basic human joy in killing a thief in the act—becomes hugely intensified. They had known what he was, and that was both sufficient warning and a direct affront to Louis Wu.

The kzinti and human tourists and natives milling in the street below looked innocent enough, and probably were. If an ARM was watching him now, it would be through binoculars, from a window in one of those black-eyed buildings. None of the tourists were looking up, but Louis Wu's eyes found a kzinti, and locked.

Eight feet tall, three feet broad, thick orange fur turning gray in spots: he was very like the dozens of kzinti about him. What caught Louis's eye was the way the fur grew. It was tufted, patchy and whitened over more than half the alien's body, as if the skin below were extensively scarred. There were black markings around his eyes, and the eyes weren't looking at scenery. They were searching the faces of passing humans.

Louis wrenched himself free of the urge to gape and stare.

He turned and went inside, in no obvious haste. He locked his balcony doors and armed the alarms, and then he dug his droud out of its hiding place in the table. His hands trembled.

It was Speaker-to-Animals he had seen—for the first time in twenty years. Speaker-to-Animals, once an ambassador to human space; Speaker, who had explored a minuscule section of the enormous structure called the Ringworld with Louis Wu and a Pierson's puppeteer and a very odd human girl; who had earned his full name from the Patriarch of Kzin for the treasure he brought back. You could die, now, for calling him by a profession, but what was his new name? Something that started with a cough, like a German *ch*, or like the warning cough a lion might give: *Chmeee*, that was it. But what could he be doing here? With a true name and land and a harem already mostly pregnant, Chmeee had had no intention of leaving Kzin ever again. The idea of his playing tourist on an annexed human world was ridiculous.

Could he possibly know that Louis Wu was in the Canyon?

He had to get out, now. Up the Canyon wall to his ship.

And that was why Louis Wu was playing with the timer in his droud, squinting as he used tiny instruments on tiny settings. His hands trembled irritatingly. The timing would have to be changed anyway, now that he was leaving Canyon's twenty-seven-hour day. He knew his target. There was another world in human space whose surface was largely barren moonscape. He could land a ship undetected in the vacuum at the West End of Jinx; and set the timing on the droud *now*; and take a few hours under the wire *now* to nerve himself. It all made perfect sense. He gave himself two hours.

Almost two hours passed before the next invader came. Rapt in the joy of the wire, Louis would not have been disturbed in any case. He found the invader something of a relief.

The creature stood solidly braced on a single hind leg and two wide-spaced forelegs. Between the shoulders rose a thick hump: the brain case, covered by a rich golden mane curled into ringlets and glittering with jewels. Two long, sinuous necks rose from either side of the brain case, ending in flat heads. Those loose-lipped mouths had served the puppeteers as hands for all of their history. One mouth clutched a stunner of human make with a long forked tongue curled around the trigger.

Louis Wu had not seen a Pierson's puppeteer in twenty-two years. He thought it quite lovely.

And it had appeared from nowhere. This time Louis had seen it blink into existence in the middle of his yellow grass rug. He had worried needlessly; the ARM had not been involved at all. The problem of the Canyonite burglars was solved.

"Stepping disks!" Louis cried joyfully. He launched himself at the alien. This would be easy, puppeteers were cowards—

The stunner glowed orange. Louis Wu spilled onto the carpet with every muscle limp. His heart labored. Black spots formed before his eyes.

The puppeteer stepped delicately around the two dead men. It looked down at him from two directions; and then it reached for him. Two sets of flat-topped teeth clamped on his wrists, not hard enough to hurt. The puppeteer dragged him backward across the rug and set him down.

The apartment vanished.

It could not be said that Louis Wu was worried. He felt no such unpleasant sensation. Dispassionately (for the uniform joy in the wire allows an abstraction of thought normally impossible to mortals), he was readjusting his world-picture.

He had seen the system of stepping disks on the Pierson's puppeteers' home world. It was an open teleportation system, far superior to the closed transfer booths used among the human worlds.

Apparently, a puppeteer had had stepping disks installed

in Louis's apartment; had sent two Canyonites to fetch him; when that failed, had come himself. The puppeteers must want him badly.

That was doubly reassuring. The ARM was not involved at all. And puppeteers had a million years of tradition to back their philosophy of enlightened cowardice. They could hardly want his life; they could have had it more cheaply, with less risk. He could find it easy to cow them.

He was still lying on a patch of yellow grass and binding mat. It must have been sitting on the stepping disk. There was a huge orange fur pillow across the room from him—no, it was a kzin slumped with his eyes open, asleep or paralyzed or dead. In fact it was Speaker. Louis was glad to see him.

They were in a spacecraft, a General Products hull. Beyond the transparent walls space-bright sunlight glared off sharp-edged lunar rocks. A patch of green-and-violet lichen told him he was still on Canyon.

But he wasn't worried.

The puppeteer released his wrists. Ornaments glittered in its mane: not natural jewels, but something like black opals. One flat brainless head bent and pulled the droud out of the plug in Louis's skull. The puppeteer stepped onto a rectangular plate and vanished, with the droud.

## PRESS GANG



HE KZIN'S EYES had been watching him for some time. Now the paralyzed kzin cleared his throat, experimentally, and rumbled, "Loo ee Woo."

"Uh," said Louis. He had been thinking of killing himself, but there was no way. He could barely wiggle his fingers.

"Louis, urr you wirehead?"

"Ungle," said Louis, to buy time. It worked. The kzin gave up the effort. And Louis—whose only real concern was for his missing droud—Louis followed an old reflex. He looked around him to learn just how bad his situation was.

The hexagon of indoor grass under him marked the stepping-disk receiver. A black circle beyond would be the transmitter. Otherwise the floor was transparent, as were the portside hull and the aft wall.

The hyperdrive shunt ran nearly the length of the ship, beneath the floor. Louis had to recognize the machinery from first principles. It was not of human manufacture; it had the half-melted look of most puppeteer construction. So: the ship had faster-than-light capability. It seemed he was slated for a long trip.

Through the aft wall Louis could see into a cargo hold with a curved hatch in the side. The hold was nearly filled by a skewed cone thirty feet tall and twice that long. The peak was a turret with ports for weapons and/or sensing instruments. Below the turret, a wraparound window. Lower still, a hatch that would drop to form a ramp.

It was a lander, an exploration vehicle. Human-built, Louis thought, and custom-built. It had none of that half-melted look. Beyond the lander he glimpsed a silver wall, probably a fuel tank.

He had not yet seen a door into his own compartment.

With some effort Louis flopped his head to the other side. Now he was looking forward into the ship's flight deck. A big section of the ship was opaque green wall, but he could see past it to a curved array of screens, dials with tiny, close-set numbers, knobs shaped to a puppeteer's jaws. The pilot's control couch was a padded bench with crash webbing and indentations for the hip and shoulders of a Pierson's puppeteer. There was no door in that wall.

To starboard—well, their cell was at least fairly large. He saw a shower, and a pair of sleeping plates, and an expanse of rich fur covering what might be a kzin's water bed, and between them a bulky structure Louis recognized as a food recycler and dispenser, of Wunderland make. Beyond the

THE RINGWORLD ENGINEERS

beds was more green wall, and no airlock, and that took care of that. They were in a box with no openings.

The ship was puppeteer-built: a General Products #3 hull, a cylinder flattened along the belly and rounded at the ends. The puppeteer trading empire had sold millions of such ships. They were advertised as invulnerable to any threat save gravity and visible light. About the time Louis Wu was being born, the puppeteer species had fled known space on a dash for the Clouds of Magellan. Now, two-hundred-odd years later, you still saw General Products hulls everywhere. Some had had a dozen generations of owners.

Twenty-three years ago, the puppeteer-built spacecraft, *Liar*, had crashed into the Ringworld surface at seven hundred and seventy miles per second. A stasis field had protected Louis and the other passengers—and the hull wasn't even scratched.

"You're a kzin warrior," Louis said. His lips were thick and numb. "Can you batter your way through a General Products hull?"

"No," said Speaker. (*Not Speaker. Chmeee!*)

"It was worth asking. Chmeee, what are you doing on Canyon?"

"I was sent a message. Louis Wu is in the Gash on Warhead, living under the wire. There were holograms for proof. Do you know what you look like under the wire? A marine plant, with fronds stirring at the whim of the current."

Louis found there were tears dripping down his nose. "Tanj. Tanj for torment. Why did you come?"

"I wanted to tell you what a worthless thing you are."

"Who sent that message?"

"I didn't know. It must have been the puppeteer. It wanted us both. Louis, is your brain so ruined that you did not notice that the puppeteer—"

"Isn't Nessus. Right. But did you see the way it keeps its mane? That ornate hair style must cost it an hour a day, easy. If I'd seen it on the puppeteer world I'd think its rank was high."

"Well?"

"No sane puppeteer would risk its life to interstellar travel. The puppeteers took their entire world with them, not to mention four farming worlds; they're going hundreds of thousands of years at sublight speeds, just because they don't trust spaceships. Whoever this one is, it's crazy, just like any puppeteer ever seen by humans. I don't know what to expect from it," said Louis Wu. "But it's back."

The puppeteer was on the flight deck, on a hexagonal stepping disk, watching them through the wall. It spoke in a woman's voice, a lovely contralto. "Can you hear me?"

Chmeee lurched away from the wall, held his feet for an instant, then dropped to all fours and charged. He thudded hard against the wall. Any puppeteer should have flinched, but this one didn't. It said, "Our expedition is almost assembled. We lack only one member of our crew."

Louis found he could roll over, and he did. He said, "Back up and start from the beginning. You've got us in a box, you don't have anything to hide. Who are you?"

"You may choose any name for me that pleases you."

"What are you? What do you need from us?"

The puppeteer hesitated. Then, "I was Hindmost to my world. I was mate to the one you knew as Nessus. Now I am neither. I need you as crew for a return expedition to the Ringworld, to restore my status."

Chmeee said, "We will not serve you."

Louis asked, "Is Nessus all right?"

"I thank you for your concern. Nessus is healthy in mind and body. The shock he suffered on the Ringworld was just what was needed to restore his sanity. He is at home taking care of our two children."

What Nessus had suffered, Louis thought, would have shocked anybody. Ringworld natives had cut off one of his

heads. If Louis and Teela had not thought of using a tourniquet on the alien's throat, Nessus would have bled to death. "I take it you transplanted a new head onto him."

"Of course."

Chmeee said, "You would not be here if you were not insane. Why would your trillion puppeteers elect a damaged mind to rule them?"

"I do not consider myself insane." The puppeteer's hind leg flexed restlessly. Its faces, if they showed any expression at all, showed only loose-lipped idiocy. "Please do not refer to this again. I served my species well, and four Hindmosts served well before me, before the Conservative faction found power to replace my faction. They are wrong. I will prove it. We will go to the Ringworld and find treasure beyond their puny understanding."

"To kidnap a kzin," Chmeee rumbled, "is probably a mistake." His long claws were extended.

The puppeteer looked at them through the wall. "You would not have come. Louis would not have come. You had your status and your name. Louis had his droud. Our fourth member was a prisoner. My agents inform me that she has been freed and is on her way to us."

Louis laughed bitterly. All humor was bitter without the droud. "You really don't have much imagination, do you? It's just like the first expedition. Me, Chmeee, a puppeteer, and a woman. Who's the woman? Another Teela Brown?"

"No! Nessus was terrified of Teela Brown, with reason, I believe. I've stolen Hairloprillalar from the mouths of the ARM. We will have a Ringworld native guide. As for the character of our expedition, why would I discard a winning strategy? You *did* escape the Ringworld."

"All but Teela."

"Teela stayed of her own choice."

The kzin said, "We were paid for our efforts. We brought home a spacecraft capable of crossing a light year in one point two five minutes. That ship bought me my name and my status. What can you offer us now, to compare with that?"

"Many things. Can you move now, Chmeee?"

The kzin stood up. He seemed to have shaken off most of the effects of the stunner. Louis was still dizzy and numb in the extremities.

"Are you in health? Is there dizziness or ache or nausea?"

"Why so anxious, root eater? You left me in an autodoc for over an hour. I lack coordination and I am hungry, nothing worse."

"Good. We were able to test the substance only so far. Very well, Chmeee, you have your payment. Boosterspice is the medicine that has kept Louis Wu young and strong for two hundred and twenty-three years. My people have developed an analogue for kzin. You may take the formula home to the Kzin Patriarchy when our mission is complete."

Chmeee seemed nonplussed. "I will grow young? This muck is in me already?"

"Yes."

"We could have developed such a thing ourselves. We did not want it."

"I need you young and strong. Chmeee, there is no great danger in our mission! I don't plan to land on the Ringworld itself, only on the spaceport ledge! You may share any knowledge we find, and so will you, Louis. As for your immediate reward—"

What appeared on the stepping disk was Louis Wu's droud. The casing had been opened and resealed. Louis's heart leapt.

"Don't use it yet," Chmeee said, and it was an order.

"All right. Hindmost, how long were you watching me?"

"Fifteen years ago I found you in the Canyon. My agents were already at work on Earth, trying to free Hairloprillalar. They were having little success. I installed stepping disks in your apartment and waited for the proper time. I go now to enlist our native guide." The puppeteer mouthed something

in the array of controls, walked forward and was gone.

"Do not use the droud," Chmeee said.

"Whatever you say," Louis turned his back. He would know he'd gone crazy when his need for the wire impelled him to attack a kzinti. At least one good thing might come out of this, and he clung hard to that thought.

He'd been able to do nothing for Hallopriplilar.

Hallopriplilar had been thousands of years old when she joined Louis and Nessus and Speaker-to-Animals in their search for a way off the Ringworld. The natives who lived beneath her floating police station had been treating her as a sky-living goddess. The whole team had played that game, living as gods to the natives with Hallopriplilar's help, while they wended their way back to the wrecked *Liar*. And she and Louis had been in love.

The Ringworld natives, the three forms that the team had met, had all been related to humanity, but not quite human. Hallopriplilar was nearly bald, and had no more everted lips than a monkey and no more breasts than a cat. Sometimes the very old seek nothing but variety in their love affairs. Louis had wondered if that was happening to him. He could see character flaws in Prill, but, tanj! He had his own collection.

And he owed Hallopriplilar. They had needed her help, and Nessus had used a puppeteer's peculiar brand of force on her. Nessus had conditioned her with a wasp. Louis had let him do it.

She had returned with Louis to human space. She had gone with him into the UN offices in Berlin, and never come out. If the Hindmost could break her loose and return her home... it was more than Louis Wu could do for her.

Chmeee said, "I think the puppeteer must be lying. Delusions of grandeur. Why would puppeteers allow one of unsound mind to rule them?"

"They won't try it themselves. Risk. Uneasy sits the butt that bears the boss. For puppeteers it makes a kind of sense, picking the brightest of a tiny percentage of megalomaniacs—Or look at it from the other side: a line of Hindmosts teaching the rest of the population to keep their heads down, don't try for too much power, it isn't safe. It could work either way."

"You think he told the truth?"

"I don't know enough. What if he is lying? He's got us."

"He's got you," said the kzinti. "He's got you by the wire. Why aren't you ashamed?"

Louis was ashamed. He was fighting to keep the shame from crippling his mind, locking him in black despair. He had no way out of this physical box: walls and floor and ceiling were part of a General Products hull. But there were elements...

"If you're still thinking about breaking out," he said, "you'd better think about this. You'll be getting young. He wouldn't have lied about that; there wouldn't be any point. What happens when you get young?"

"Stronger appetite. More stamina. A tendency to fight—and you'd better worry about that, Louis."

Chmeee had gained bulk as he aged. The black "spectacle" marks around his eyes were nearly all grey, and there was some grey elsewhere. Hard muscle showed when he moved; no sensible younger kzinti would fight him. But what mattered was the scars. The fur, and a good deal of skin, had been burned off over more than half of Chmeee's body the last time Chmeee had seen the Ringworld. Twenty-three years later the fur had grown back; but it grew in ragged tufts above the scar tissue.

"Boosterspice heals scars," Louis said. "Your fur will grow out smooth. No white in it either."

"Well, then, I will be prettier." The tail slashed air. "I must kill the leaf eater. Scars are like memories. We do not have them removed."

"How are you going to prove you're Chmeee?"

The tail froze. Chmeee looked at him.

"He's got me by the wire." Louis had reservations regarding that remark, but he could be speaking for a microphone. A puppeteer would not ignore the possibility of mutiny. "He's got you by the harem, and the land, and the privileges, and the name that belongs to Chmeee the aging hero. The Patriarch may not believe your story, not unless you've got kzinti boosterspice and the Hindmost's word to back you up."

"Be silent."

It was all suddenly too much for Louis Wu. He reached for the droud—and the kzinti pounced. Chmeee turned the black plastic case in a black-and-orange hand.

"As you like," Louis said. He flopped on his back. He was short of sleep anyway.

"How did you come to be a wirehead? How?"

"I," said Louis, and, "What you've got to understand," and, "Remember the last time we met?"

"Yes. Few humans have been invited to Kzin itself. You deserved the honor, then."

"Maybe. Maybe I did. Do you remember showing me the House of the Patriarch's Past?"

"I do. You tried to tell me that we could improve interspecies relationships. All we need do was let a team of human reporters go through the museum with holo cameras."

Louis smiled, remembering. "So I did."

"I had my doubts."

The House of the Patriarch's Past had been both grand and grandiose: a huge, sprawling building formed from thick slabs of volcanic rock fused at the edges. It was all angles, and there were laser cannon mounted at four tall towers. The rooms went on and on. It had taken Chmeee and Louis two days to go through it.

The Patriarch's official past went a long way back. Louis had seen ancient sthondat thighbones with grips worked into them—clubs used by primitive kzinti. He'd seen weapons that could have been classed as hand-cannons; few humans could have lifted them. He'd seen silver-plated armor as thick as a safe door, and a two-handed ax that might have chopped down a mature redwood. He'd been talking about letting a human reporter tour the place, when they came upon Harvey Mossbauer.

Harvey Mossbauer's family had been killed and eaten during the Fourth Man-Kzin War. Many years after the truce, and after a good deal of monomaniacal preparation, Mossbauer had landed alone and armed on Kzin. He had killed four kzinti males and set off a bomb in the harem of the Patriarch before the guards killed him. They were hampered, Chmeee had explained, by their wish to get his hide intact.

"You call that intact?"

"But he fought. How he fought! There are tapes. We know how to honor a brave and powerful enemy, Louis."

The stuffed skin was so scarred that you had to look twice to tell its species; but it was on a tall pedestal with a humilment plaque, and there was nothing around it but floor. Your average human reporter might have misunderstood, but Louis got the point. "I wonder if I can make you understand," he said, twenty years later, a wirehead kidnapped and robbed of his droud, "how good it felt, then, to know that Harvey Mossbauer was human."

"It is good to reminisce; but we were talking of current addiction," Chmeee reminded him.

"Happy people don't become current addicts. You have to actually go and get the plug implanted. I felt good that day. I felt like a hero. Do you know where Hallopriplilar was at that time?"

"Where was she?"

"The government had her. The ARM. They had lots of questions, and there wasn't a tanj thing I could do about it. She was under my protection. I took her back to Earth with me—"

"She had you by the glands, Louis. It's good that kzinti females aren't sentient. You would have done anything she asked. She asked to see human space."

"Sure, with me as native guide. It just didn't happen. Chmeee, we took home the *Long Shot* and Halrloprillalar, and we turned them over to a Kzin and Earth coalition, and that's the last we've seen of either one. We couldn't even talk about it to anyone."

"The second quantum hyperdrive motor became a Patriarch's Secret."

"It's Top Secret to the United Nations, too. I don't think they even told the other governments of human space, and they made it tanj clear I'd better not talk. And of course the Ringworld was part of the secret, because how could we have got there without the *Long Shot*? Which makes me wonder," Louis said, "how the Hindmost expects to reach the Ringworld. Two hundred light years from Earth—more, from Canyon—at three days to the light year if he uses this ship. Do you think he's got another *Long Shot* hovering somewhere?"

"You will not distract me. Why did you have a wire implanted?" Chmeee stood crouched with claws extended. Maybe it was a reflex, beyond conscious control—maybe.

"I left Kzin and went home," Louis said. "I couldn't get the ARM to let me see Prill. If I could have got a Ringworld expedition together she would have had to go as native guide, but, tanj! I couldn't even talk about it except to the government—and you. You weren't interested."

"How could I leave? I had land and a name and children coming. Kzinti females are very dependent. They need care and attention."

"What's happening to them now?"

"My eldest son will administer my holdings. If I leave him too long he will fight me to keep them. If—Louis! Why did you become a wirehead?"

"Some clown hit me with a *tasp*!"

"Ur?"

"I was wandering through a museum in Rio when somebody made my day from behind a pillar."

"But—Nessus took a *tasp* to the Ringworld, to control his crew. He used it on both of us."

"Right. How very like a Pierson's puppeteer, to do us good by way of controlling us! The Hindmost is using the same approach now. Look, he's got my droud under remote control, and he's given you eternal youth, and what's the result? We'll do anything he tells us to, that's what."

"Nessus used the *tasp* on me, but I am not a wirehead."

"I didn't turn wirehead either—then. But I remembered. I was feeling like a louse, thinking about Prill, thinking about taking a sabbatical. I used to do that, take off alone in a ship and head for the edge of known space until I could stand people again. Until I could stand myself again. But it would have been running out on Prill. Then some clown made my day. He didn't give me much of a jolt, but it reminded me of that *tasp* Nessus carried, and that was ten times as powerful. I...held off for almost a year, and then I went and got a plug put in my head."

"I should rip that wire out of your brain."

"There turn out to be undesirable side effects."

"How did you come to the Gash on Warhead?"

"Oh, that. Maybe I was paranoid, but look: Halrloprillalar vanished into the ARM building and never came out. Here Louis Wu was turning wirehead, and no telling who the silly flatlander might tell secrets to. I thought I'd better run. Canyon's easy to land a ship on without being noticed."

"I expect the Hindmost found it so."

"Chmeee, give me the droud or let me sleep or kill me. I'm fresh out of motivation."

"Sleep, then."

## GHOST AMONG THE CREW



T WAS GOOD TO WAKE floating between sleeping plates—until Louis remembered.

Chmeee was tearing at a joint of raw red meat. Wunderland often made these food recyclers to serve more than one species. The kzint stopped eating long enough to say, "Every piece of equipment aboard was built by humans or could have been built by humans. Even the hull could have been bought on any human world."

Like a baby in its womb, Louis floated in free fall, with his eyes closed and his knees drawn up. But there was no way to forget where he was. He said, "I thought the big lander had a Jinxian look. Made to order, but on Jinx. What about your bed? Kzinti?"

"Artificial fiber. Made to resemble the pelt of a kzint and sold in secret, no doubt, to humans with an odd sense of humor. I would find pleasure in hunting down the manufacturer."

Louis reached out and tripped the field control switch. The sleeping field collapsed, lowering him gently to the floor.

It was night outside: sharp white stars overhead and a landscape that was formless velvet black. Even if they could get to spacesuits, the Canyon would be halfway around the planet. Or just beyond that black ridge projecting into the starscape; but how would he know?

The recycler kitchen had two keyboards, one in Interworld lettering and one for the Hero's Tongue. And two toilets on opposite sides. Louis would have preferred a less explicit arrangement. He dialled for a breakfast that would test the kitchen's repertoire.

The kzint snarled, "Does the situation interest you at all, Louis?"

"Look beneath your feet."

The kzint knelt. "Ur...yes. Puppeteers built the hyperdrive shunt. This is the ship in which the Hindmost fled from the Fleet of Worlds."

"You forgot the stepping disks, too. The puppeteers don't use them anywhere but their own world. Now we find the Hindmost sending human agents to get me, on stepping disks."

"The Hindmost must have stolen them, and the ship, and little else. His funds may have been owed to General Products and never claimed. Louis, I do not believe the Hindmost has puppeteer support. We should try to reach the puppeteer fleet."

"Chmeee, there are bound to be microphones in here."

"Should I watch my speech for this *leaf eater*?"

"All right, let's look at it." The depression he was feeling came out as bitter sarcasm; and why not? Chmeee had his droud. "A puppeteer has indulged a whim for kidnapping men and kzinti. Naturally the honest puppeteers will be horrified. Are they really going to let us run home and build more *Long Shots*, which could reach the puppeteer fleet in just over four hours plus acceleration time to match velocities, say three months at three gravities—"

"Enough, Louis!"

"Tanj, if you wanted to start a war you had your chance! According to Nessus, the puppeteers meddled in the First Man-Kzin War, in our favor. Now, hold it. Do not tell me whether you told anyone else."

"Drop the subject now."

"Sure. Only, it just hit me—" and because the conversation might be recorded, he spoke partly for the Hindmost's benefit. "You and I and the Hindmost are the only ones in known space who know what the puppeteers have been doing, besides anyone either of us might have told."

"If we should be lost on the Ringworld, would the Hindmost mourn forever? I see your point. But the Hindmost might not even know that Nessus was indiscreet."

He'll know if he plays this back, Louis thought. My fault. I

should watch my speech for a leaf eater? He attacked his meal with some ferocity.

He had chosen for both simplicity and complexity: half a grapefruit, a chocolate soufflé, broiled moa breast, Jamaica Blue Mountain coffee topped with whipped cream. Most of it was good; only the whipped cream was unconvincing. But what could you say about the moa? A twenty-fourth-century geneticist had re-created the moa, so he'd claimed, and the recycler kitchen produced an imitation of that. It had good texture and tasted like rich bird meat.

It was nothing like being under the wire.

He had learned to live with this part-time depression. It existed only by contrast with the wire; Louis believed that it was the normal state of being for humanity. Being imprisoned by a mad alien for peculiar purposes didn't make it that much worse. What made the black morning so terrible was that Louis Wu was going to have to give up the droud.

Finished, he dumped the dirty dishes into the toilet. He asked, "What will you take for the droud?"

Chmeee snorted. "What have you got?"

"Promises made on my word of honor. And a good set of informal pajamas."

Chmeee's tail slashed at the air. "You were a useful companion, once. What will you be if I give you the droud? A brawling beast. I will keep the droud."

Louis began his exercises.

One-hand pushups were easy in half a gravity. One hundred each were not. The dorsal curve of the hull was too low for some of his routines. Two hundred scissors jumps, touching extended fingers to extended toes—

Chmeee watched curiously. Presently he said, "I wonder why the Hindmost lost his honors."

Louis didn't answer. Suspended horizontally with toes under the bottom sleeping-field plate and a platter under his calves, he was doing very slow situps.

"And what he expects to find on the spaceport ledge. What did we find? The deceleration rings are too big to move. Could he want something from a Ringworlder spacecraft?"

Louis dialled for a pair of moa drumsticks. He wiped the grease off them and began juggling them: oversized Indian clubs. Sweat formed in big droplets before reluctantly moving down his face and torso.

Chmeee's tail lashed. His large pink ears folded back, offering no purchase to an enemy. Chmeee was angry. That was his problem.

The puppeteer flicked into existence, one impervious wall away. It had changed the style of its mane, substituting points of light for the opals, and it was alone. It studied the situation for a moment. It said, "Use the droud, Louis."

"I don't have the option." Louis discarded the weights. "Where's Prill?"

The puppeteer said, "Chmeee, give Louis the droud."

"Where's Haarloplillalar?"

A tremendous furry arm enclosed Louis's throat. Louis kicked backward, putting his whole body into it. The kzin grunted. With curious gentleness he inserted the droud into its socket.

"All right," Louis said. The kzin let him go and he sat down. He'd guessed already; and so had the kzin, of course. Louis began to realize how much he had wanted to see Prill, to see her free of the ARM, to see her.

"Haarloplillalar is dead. My agents cheated me," the puppeteer said. "They have known that the Ringworld native was dead for eighteen standard years. I could stay to root them out wherever they have hidden, but it might take another eighteen years. Or eighteen hundred! Human space is too big. Let them keep their stolen money."

Louis nodded, smiling, knowing that this was going to hurt when he removed the droud. He heard Chmeee ask, "How did she die?"

"She could not tolerate boosterspice. The United Nations

now believes that she was not quite human. She aged very rapidly. A year and five months after reaching earth, she was dead."

"Already dead," Louis mused. "When I was on Kzin..." But there was a puzzle here. "She had her own longevity drug. Better than boosterspice. We brought a cryoflask home with us."

"It was stolen. I know nothing more."

Stolen? But Prill had never walked the streets of Earth, to meet common thieves. United Nations scientists might have opened the flask to analyze the stuff, but they wouldn't need more than a microgram. He might never know. And afterward they had kept her, to take her knowledge before she died.

This was definitely going to hurt. But not yet.

"We need not delay longer." The puppeteer settled itself in its padded bench. "You will travel in stasis, to conserve resources. I have an auxiliary fuel tank to be dropped before we enter hyperspace. We will arrive fully fueled. Chmeee, would you name our ship?"

Chmeee demanded, "Do you propose to explore blinded, then?"

"Only the spaceport ledge, and no further. Would you name our ship?"

"I name it *Hot Needle of Inquiry*."

Louis smiled and wondered if the puppeteer recognized the term. Their ship was now named for a kzin instrument of torture. The puppeteer mouthed two knobs and brought them together.

## OFF CENTER



OUIS SAGGED AS HIS WEIGHT suddenly doubled. The black Canyonscape was gone. It must be invisible in the starscape now, a changed starscape in which one star, directly underfoot, shone brighter than all the rest. The Hindmost disengaged itself from crash web and pilot's bench. The puppeteer had changed, too. It moved as if tired, and its mane—differently styled now—seemed not to have been set for some time.

Current didn't deaden the brain. Louis could see the obvious: that he and Chmeee must have spent two years in stasis, while the puppeteer flew *Needle* alone through hyperspace; that known space, a bubble of explored star systems some forty light years in radius, must be far behind them; that *Hot Needle of Inquiry* was built to be flown by a Pierson's puppeteer with its passengers in stasis, and only a puppeteer's mercy would ever return them; that he had seen a human being for the last time, and Haarloplillalar was dead of Louis Wu's carelessness, and he was going to feel terribly lonely when the droud came out of his head, and that would be soon. None of that mattered yet, while the tiny current still trickled into his brain.

He saw no drive flame. *Hot Needle of Inquiry* must be moving on reactionless thrusters alone.

*Liar*'s designers had mounted the ship's motors on its great delta wing. Something like a tremendous laser blast had fired on them as they passed above the Ringworld, and the motors had been burned off. The Hindmost would not have repeated that mistake, Louis thought. *Needle*'s thrusters would be mounted inside the impervious hull.

Chmeee asked, "How long until we can land?"

"We can be ready to dock in five days. I was unable to take advanced drive systems from the Fleet of Worlds. With human-built machinery we can decelerate only at twenty gravities. Do you find the cabin gravity comfortable?"

"A bit light. One Earth gravity?"

"One Ringworld gravity, .992 Earth gravity."

"Leave it as it is. Hindmost, you gave us no instruments. I would like to study the Ringworld."

The puppeteer pondered the point. "Your lander vehicle includes a telescope, but it would not point straight down.

THE RINGWORLD ENGINEERS

Wait several moments." The puppeteer turned to its instrument board. One head turned back and spoke in the hissing-spitting-snarling accents of the Hero's Tongue.

Chmee said, "Use Interworld. Let Louis listen, at least."

The puppeteer did. "It is good to speak again in any language. I was lonely. There, I give you a projection from *Nedelle's* telescope."

An image appeared below Louis Wu's feet: a rectangle, with no borderlines, in which the Ringworld sun and the stars around it were suddenly far larger. Louis blocked the sun with his hand and searched. The Ringworld was there: a thread of baby blue forming a half-circle.

Picture fifty feet of baby-blue Christmas ribbon one inch wide. String it in a circle, on edge on the floor, and put a candle in the middle. Now expand the scale:

The Ringworld was a ribbon of unreasonably strong material, a million miles wide and six hundred million miles long, strung in a circle ninety-five million miles in radius with a sun at the center. The ring spun at seven hundred and seventy miles per second, fast enough to produce one gravity of centrifugal force outward. The unknown Ringworld engineers had layered the inner surface with soil, and oceans, and an atmosphere. They had raised walls a thousand miles high at each rim to hold the air inside. Presumably air leaked over the rim walls anyway, but not quickly. An inner ring of twenty rectangular shadow squares, occupying what would have been the orbit of Mercury in Sol system, gave day and night to the Ringworld.

The Ringworld was six hundred million million square miles of habitable planet. Three million times the area of the Earth.

Louis and Speaker-to-Animals and Nessus and Teela Brown had travelled across the Ringworld for almost a year: two hundred thousand miles across the width, then back to the point where *Liar* had crashed. A fifth of the width. It hardly made them experts. Could a thinking being ever have claimed to be expert on the Ringworld?

But they had examined one of the spaceport ledges on the outside of the rim wall. If the Hindmost spoke the truth, they would need no more. Land on the spaceport ledge, pick up whatever the Hindmost expected to find, and go. Fast! Because—

Because within the rectangular telescope image that the Hindmost had set before them, it was painfully obvious: the baby-blue arc of Ringworld—the color of three million Earthlike worlds, too far away for detail to show, but banded with midnight blue from the shadow squares—was well off-center from its sun.

"We didn't know this," Chmee said. "We spent a Kzin year on the structure and did not know this. How could we not?"

The puppeteer said, "The Ringworld could not have been off center when you were here. It was twenty-three years ago."

Louis nodded. To speak would be distracting. Only the joy of the wire now held away horror for the fate of the Ringworld natives, fear and guilt for himself. The Hindmost continued, "The Ringworld structure is unstable in the plane of its orbit. Surely you knew?"

"No!"

Louis said, "I didn't know myself till after I was back on Earth. I did some research then."

Both aliens were looking at him. He hadn't really wanted that much of their attention. Oh, well. "It's easy enough to show that the Ringworld is unstable. Stable along the axis, but unstable in the plane. There must have been something to keep the sun on the axis."

"But it's off center now!"

"Whatever it was stopped working."

Larry Niven

## GLOSSARY

**antispinwards** direction opposite the Ringworld's direction of spin.

**beltier** citizen of the asteroid belt, Sol system

**Control Center**: see *Repair Center*.

**citzlang brone**: a City Builder device, a beamer that allows solid objects, freight, passengers etc. to penetrate scrith.

**droid**: a small device that plugs into the skull of a current addict. Its purpose: to meter the current flow to the pleasure center of the addict's brain.

**elbow root**: Ringworld plant grown for fences.

**flup**: seabottom ooze.

**fooch (foochest)**: stone couches set throughout the kzinti hunting parks.

**Long Shot**: see *Quantum II Hyperdrive*.

**make his (her) day**: use a *tasp* on him (her), especially from concealment.

**Outsider**: intelligent life form whose biochemistry is based on liquid metal and the thermoelectric effect. Outsider ships roam the stars at sublight speeds, trading in information.

**Outsider hyperdrive**: never used by the outsiders themselves, but used extensively by the star-travelling species of known space.

**port**: to the left as one faces spinward.

**Quantum II Hyperdrive**: developed by Pierson's puppeteers, this mode of travel is enormously faster than the Outsider hyperdrive. *Long Shot* was the prototype spacecraft, the first to visit the galactic core.

**Repair Center**: (hypothetical center of Ringworld maintenance and controls).

**rishathra**: sex practices outside of one's species (but within the hominids).

**scrith**: Ringworld structural material. Scrith underlies all of the terraformed and contoured inner surface of the Ringworld. The rim walls are also of scrith. Very dense, with a tensile strength on the order of the force that holds atomic nuclei together.

**spill mountains**: mountains standing against the rim wall. They have their own ecology. One stage is in the circulation of *flup*.

**spaghetti plant**: Ringworld plant, description obvious. Edible.

**splawndis**: in the direction of rotation of the Ringworld.

**starboard**: to the right as one faces spinward.

**stasis**: a condition in which time passes very slowly. Ratios can be as high as half a billion years of real time to a few seconds in stasis. An object in stasis is very nearly invulnerable.

**tanj**: initial slang for "There Ain't No Justice." Used as an expletive.

**tasp**: a hand-held device to tickle the pleasure center of a human brain at a distance.

**thruster**: reactionless drive, has generally replaced fusion rockets on all spacecraft save warcraft.

**weenie plant**: Ringworld plant similar to melons or cucumbers, but growing in links. Clusters of roots spring from the nodes. Grows in damp areas. Edible.

## RINGWORLD PARAMETERS

30 hours = 1 Ringworld day

1 turn = 7½ days = 1 Ringworld rotation

75 days = 10 turns = 1 falan

Mass =  $2 \times 10^{30}$  grams

Radius =  $.95 \times 10^7$  miles

Circumference =  $5.97 \times 10^8$  miles

Width = 997,000 miles

Surface area =  $6 \times 10^{14}$  square miles =  $3 \times 10^6$  times the surface area of Earth (approx.)

Surface gravity = 31 feet/second/second = .992 G

Rim walls rise inward, 1,000 miles high.

Star: G3 verging on G2, barely smaller and cooler than Sol.

Chmee clawed at the invisible floor. "But then they must die! Billions of them, tens of billions... trillions?" He turned to Louis. "I tire of your fatuous smile. Would you talk better without the droud?"

"I can talk fine."

"Talk then. Why is the Ringworld unstable? Is it not in orbit?"

"No, of course not. It has to be rigid. That terrific spin would pull it rigid. If you nudge the Ringworld off center it'll fall farther off center. But the equations are pretty hairy. I played around with a computer and I got numbers I'm not sure I believe."

The Hindmost said, "At one time we thought we might

build our own Ringworld. The instability is too great. Even a strong solar flare would exert enough pressure on the structure to throw it off balance. Five years later it would grind against its sun."

"That's the same figure I got," Louis said. "That must be what happened here."

Chmee was clawing the floor again. "Attitude jets! The Ringworld engineers would have mounted attitude jets!"

"Maybe. We know they had Bussard ramjets. They used them to drive their starships. Okay, a lot of big Bussard ramjets on the rim walls would be enough to keep the Ringworld centered. The motors would fuse the hydrogen in the solar wind. They'd never run out of fuel."

"We saw nothing. Think how huge the motors would have to be!"

Louis chuckled. "What do you call huge? On the Ringworld? We missed them, that's all." But he couldn't like the way Chmee stood above him with claws extended.

"You accept it all so easily? There may be enough Ringworld natives to crowd the worlds of known space thousands of times over. They are more nearly your kind than mine."

"You're a ruthless, merciless carnivore. Try to remember," Louis told the kzin. "Look. It'll bother me. It'll bother me a lot after the Hindmost turns off my droud. But it won't kill me, because I'll be a little bit used to it by then. Can you think of anything we can do to help them? Anything?"

The kzin turned away. "Hindmost, how much time do they have left?"

"I will attempt to find out."

The sun was well off center to the Ringworld. Louis guessed it might be, oh, seventy million miles from the near side, which would put it a hundred and twenty million miles from the far side. The near side would be getting nearly three times as much sunlight as the far side, and the structure rotated in seven and a half thirty-hour days. There would be weather. Plants that couldn't take the changes would be dying. And animals. And men.

The Hindmost had finished its work at the telescope. Now it worked at the computer, out of sight behind the solid green wall. Louis wondered what else was concealed in that hidden part of the ship.

The puppeteer trotted into view. "One year and five months from now, the Ringworld will graze its sun. I expect it will disintegrate then. Given their rotational velocity the fragments would all recede into interstellar space."

"Shadow squares," Louis murmured. There was an inner ring of sunshades, close to the sun, scaled to give the Ringworld a thirty-hour day.

"What? Yes, the shadow squares would impact before the sun. Still, we should have at least a year. Plenty of time for us," the Hindmost said briskly. "We will not touch the Ringworld surface at all. Your expedition examined the spaceport ledge, from some tens of thousands of miles away, without being fired on by the Ringworld meteor defenses. I believe the spaceport has been abandoned. We can land in safety."

Chmee asked, "What do you expect to find?"

"I'm surprised you haven't remembered." The Hindmost turned to its control board. "Louis, you've had enough time—"

"Wait—"

The wire in his brain went dead.

#### WITHDRAWAL SYMPTOMS

LOUIS WATCHED THROUGH THE WALL as the puppeteer worked on his droud. He thought of death in mind-stunning numbers, and death as his own very personal experience, and death for aliens who

monitored the current to his brain.

Flat heads poised and shifted and nosed the small black casing as if nibbling at a dubious meal. Long tongues and sensitive lips worked inside the casing. In a few minutes the puppeteer had reset the timer to a thirty-hour day, and cut the current by half.

The next day it was pure joy unfiltered by human senses, and nothing could actually bother him, but—Louis had trouble defining his own feelings. When the current cut off too soon that evening, depression dropped over him like thick saffron smog.

Then Chmee stooped above Louis Wu, pulled the droud from his scalp, and set it on the stepping disk to be flicked to the flight deck. For resetting. Again.

Louis screamed and leapt. He scrambled up the kzin's broad back via fur handholds and tried to tear his ears off. The kzin whirled. Louis found himself clinging to a great arm, found the arm slinging him across the room. He fetched up against a wall. Half-stunned, with blood streaming down his torn arm, Louis turned to the attack.

He turned in time to see Chmee leap onto the stepping disk, just as the Hindmost mouthed the controls.

Chmee crouched on the black disk looking dangerous and foolish.

The Hindmost said, "Nothing so massive may be flicked to these disks. Do you judge me an idiot, to flick a kzin onto my own flight deck?"

Chmee snarled, "How much intelligence does it take to sneak up on a leaf?" He flipped the droud to Louis and shambled toward his water bed.

A diversion. Chmee had snatched the droud from Louis's scalp just after it switched off, solely to drive Louis Wu into berserker rage, to distract the puppeteer's attention.

The Hindmost said, "When next I alter your droud I will do it just before you plug in. Does that make you happy?"

"You know tanj well what makes me happy!" Louis held the droud tightly. It was dead, of course, dead until the timer made it live again.

"You are nearly as long-lived as we are. This is so temporary," the Hindmost wheedled him. "You will be wealthy beyond dreams! The Ringworld spacecraft used a method of cheap, large-scale transmutation, the same that they must have used to build the Ringworld itself!"

Louis looked up, startled.

"I wish we knew the mass and bulk of the machine," the puppeteer continued. "The Ringworld spacecraft are tremendous things. But we need not transport it. If necessary a hologram taken by deep-radar, and holograms of the mechanism in action, should be enough to convince my subjects. Then we need only send a General Products #4 craft to pick it up."

The alien would not expect a man deep in current withdrawal to respond to every little comment. Of course not. But from under his brows Louis watched Chmee, to see how he would handle it.

The kzin was admirable. For a moment he froze. Then, "How did you come to lose your prerogatives?"

"The tale is complex."

"We entered Ringworld system with eleven billion miles to fall and velocity of fifty-two thousand miles per second to be shed. Only a day has passed. We have time."

"So we do, and no other useful work. You must know, then, that Conservative and Experimentalist factions are old among us. Usually the Conservatives rule. But when our world suffered from heat pollution due to too much use of industrial power, Experimentalists moved our world outward into the cometary halo. An Experimentalist regime altered and then seeded two farming worlds. A later regime moved two more worlds inward from where they had formed as moons of distant ice giants..."

And Chmee had gained time to lose his agitation and think

THE RINGWORLD ENGINEERS

what he would say next. Good! Maybe the kzinti had earned the position he once held: Speaker-to-Animals, a junior ambassador to humanity.

"...we do the necessary things, then are deposed. It is the general rule. Experimentalists came into power when our probes learned of the Kzinti Empire. I believe Nessus told you how we handled that."

"You aided humanity." Chmeee was peculiarly still. Louis would have expected him to be tearing up the walls. "The four Wars With Men killed four generations of our mightiest fighters, so that the more docile among us might reproduce their kind."

"We hoped you would become able to deal amicably with other species. My faction also established a trading empire in this region. Despite our successes, we were losing our authority. Then it was discovered that the core of our galaxy has exploded. The shock wave will arrive in twenty thousand years. Our faction stayed in power, to arrange the exodus of the Fleet of Worlds."

"How fortunate for you. Yet they deposed you after all."

"Yes."

"Why?"

The puppeteer didn't answer for a time. Then, "Some of my decisions were not popular. I meddled with human and kzinti destiny. Somehow you learned our secret, how we had tampered with the Fertility Laws on Earth in an attempt to breed lucky humans, and with the course of the First War With Men, to produce reasonable kzinti. My predecessor established General Products, the interstellar trading empire. It was said that he had made a virtue of madness, since only the mad among us will risk their lives in space. When I arranged your expedition to explore the Ringworld, I was called mad, to risk contact with so advanced a technology. But one does not hide one's sight from danger!"

"So they deposed you."

"It may have been...a convenient excuse." The Hindmost paced restlessly: *clop clop clop, clop clop clop*. "You know that I agreed to take Nessus as mate if he returned, and we mated. Then we did it again, for love. Nessus was mad, and the Hindmost has often been mad, and...they deposed me."

Louis suddenly asked, "Which of you is male?"

"I wonder why you did not ask that of Nessus. But he would not have told you, would he? Nessus is shy on certain subjects. We have two kinds of male, Louis. My kind implants its sperm in the female's flesh, and Nessus's kind implants its egg in the female with a most similar organ."

Chmeee asked, "You have three sets of genes?"

"No, two only. The female contributes none. In fact, females mate among themselves in another way to make more females. They are not properly of our species, though they have been symbiotic with us for all history."

Louis winced. The puppeteers bred like digger wasps; their progeny ate the flesh of a helpless host. Nessus had refused to talk about sex. Nessus was right. This was ugly.

"I was right," said the Hindmost. "I was right to send a mission to the Ringworld, and we will prove it. Five days in, and no more than ten on the spaceport ledges, and five more to reach flat space where we may escape by hyperdrive. We need never board the Ringworld at all," said the Hindmost. "Halrloprillar told Nessus that the Ringworld ships carried lead, for compactness, and transmuted it into air and water and fuel during the journey. A Conservative government could not deal with the ramifications of such a technology. They will reinstate me."

Current-withdrawal depression left Louis no urge to laugh. Still, it was all very funny, and funnier still because it was his own fault from the beginning.

The next morning the aliens cut the droid's current flow in half again, and left it alone thereafter. It shouldn't have made

that much difference. Under the wire he was still content. But—for years he had suffered through the depression when the time stopped, knowing what he would feel when the current resumed. His depressions were worse now, and there was no security. The aliens could cut the current at any time, and if they didn't he would still have to give it up.

What the aliens talked about during those four days he didn't know. He tried to concentrate on the ecstasy in the wire. Vaguely he remembered them calling up holograms from the computer. There were the faces of Ringworld natives: the small ones completely covered with golden hair (and one, a priest, was shaven); and the tremendous wire-sculpture in the Sky Castle (stub of a nose, bald head, knife-slash lips); and Halrloprillar (probably of the same race); and Seeker, the wanderer who had taken Teela under his protection (almost human, but muscled like a Jinxian, and beardless). There were cities ruined by time and by floating buildings which had fallen when their power died. There were holograms of *Liar*'s approach to a shadow square, and of a city nestled in a smoke-cloud of fallen shadow square wire.

The sun grew from a point to a black dot with a bright rim around it, its brightness blocked by flare shielding on *Needle*'s inner hull. The blue halo around the sun expanded.

In dreams Louis returned to the Ringworld. In a great floating prison he hung head down from his burned-out flycycle, fifty feet above a hard floor strewn with the bones of earlier captives. Nessus's voice beat in his ears, promising rescue that never came.

When awake he took refuge in routine—until on the evening of the fourth day he looked at his dinner, then dumped it and dialled for bread and a selection of cheeses—four days to realize that he was forever beyond the reach of the ARM. He could eat cheese again!

*What's good besides the wire?* Louis asked himself. *Cheese. Sleeping plates. Love (impractical). Wild skin-dye jobs. Freedom, security, self-respect. Winning as opposed to losing. Tanj, I've almost forgotten how to think like this, and I've lost it all. Freedom, security, self-respect. A little patience and I can take the first step. What else is good? Brandy poured in coffee. Movies.*

Twenty-three years ago, Speaker-to-Animals had brought the spacecraft *Lying Bastard* close to the Ringworld's edge. Now Chmeee and the Hindmost watched recordings of that event.

Seen from that close, the Ringworld became straight lines meeting at a vanishing point. From out of the point where the checkered blue inner surface dropped to meet the top and bottom ridges of the rim wall, the rings of the spacecraft decelerator system seemed to fly straight into the camera, over and over, in infrared and visible and ultraviolet light and deep-radar images. Or they crept past in slow motion—huge electromagnets, all identical.

But Louis Wu watched the entire eight hours of the *Changeling Earth* fantasy epic while getting soddenly drunk. Brandy in coffee, then brandy and soda, then brandy alone. It was a movie he watched, not a sensual: it used live actors and only two of the human senses. He was at two removes from reality.

At one point he tried to engage Chmeee in a discussion of Saberhagen's use of impossible visual effects. He retained just enough wit to desist at once. He dared not talk to Chmeee while drunk. *The Puppeteers have hidden ears, hidden ears—*

The Ringworld grew large.

For two days it had been a finely-etched blue ring, narrow, flimsy-looking, off-center to its sun, growing as the black circle of its sun grew. Gross detail appeared. An inner ring of black rectangles, the shadow squares. A rim wall, a mere thousand miles high, but growing to block their view of the Ringworld's inner surface. By evening of the fifth day *Hot Needle of Inquiry* had lost most of its velocity, and the rim

wall was a great black wall across the stars.

Louis was not under the wire. Today he'd forced himself to skip it; and then the Hindmost had told him that he would send no current until they had landed safely. Louis had shrugged. Soon, now—

"The sun is flaring," the Hindmost said.

Louis looked up. Meteor shielding blocked the sun. He saw only the solar corona, a circle of flame enclosing a black disk. "Give us a picture," he said.

Darkened and expanded in the rectangular "window", the sun became a huge, patterned disk. This sun was slightly smaller and cooler than Sol. There were no sunspots, no blemishes, except for a patch of glaring brightness at the center. "Our vantage is not good," the Hindmost said. "We see the flare head-on."

Chmeee said, "Perhaps the sun has become unstable recently. This could explain why the Ringworld is off center."

"It may be. *Lying Bastard's* records show a flare during your approach to the Ringworld; but for most of that year the sun was quiet." The Hindmost's heads poised above his instrument board. "Odd. The magnetic patterns—"

The black disk slid behind the black edge of the rim wall.

"The magnetic patterns of that star are most unusual," the Hindmost said.

Louis said, "So go back for another look."

"Our mission does not permit the collection of random data."

"No curiosity?"

"No."

From under ten thousand miles away, the black wall seemed straight as a ruled line. Darkness and speed blurred all detail. The Hindmost had the telescope screen set for infrared light, but it did little good—or did it? There were shadows along the bottom of the rim wall, triangles of coolness thirty to forty miles tall, as if something on the inner side of the thousand-mile-high wall was reflecting sunlight away. And here came a darker, cooler line along the bottom, moving left to right.

Chmeee asked politely, "Are we boarding or merely hovering?"

"Hovering, to assess the situation."

"The treasure is yours. You may leave without it if it pleases you."

The Hindmost was restless. His legs gripped the pilot's bench hard. Muscles twitched in his back. Chmeee was relaxed; he seemed pleased with himself. He said, "Nessus had a kzin for his pilot. There were times when he could give way to total fear. You dare not. Can the automatics land *Needle* for you while you hide in stasis?"

"What if an emergency developed? No. I did not anticipate this."

"You must land us yourself. Do it, Hindmost."

*Needle* turned nose down and accelerated.

It took nearly two hours to accelerate to the Ringworld's 770 miles/second. By then, hundreds of thousands of miles of the dark line had raced past them. The Hindmost began to ease them closer—slowly, so slowly that Louis wondered if he would back out. He watched without impatience. He wasn't under the wire, and by his own choice. Nothing else could be that important.

But where was Chmeee's patience coming from? Was Chmeee feeling his oncoming youth? A human reaching his first century could feel that he had all the time in the world, for anything. Would a kzin react that way? Or—Chmeee was a trained diplomat. Perhaps he could hide his feelings.

*Needle* balanced on belly thrusters; 992 gravities of thrust warped its path into the Ringworld's curve—if left to itself, the ship would have flung itself outward toward interstellar space. Louis watched the puppeteer's heads darting and weaving to check the dials and meters and screens

around him. Louis couldn't read them.

The dark line had become a row of rings set well apart, each ring a hundred miles across, drifting past. During the first expedition, an old recording had shown them how ships would position themselves fifty miles from the rim wall and wait for the rings to sweep them up and accelerate them from free fall to Ringworld rotation speed and dump them at the far end, on the spaceport ledge.

To left and right the black wall converged at vanishing points. It was close now, a few thousand miles away. The Hindmost tilted *Needle* to coast along the linear accelerator. Hundreds of thousands of miles of rings, but the Ringworlders had lacked gravity generators. Their ships and crews would not tolerate high accelerations.

"The rings are inactive. I find not even sensors for incoming ships," a puppeteer head turned to tell them, and turned quickly back to work.

Here came the spaceport ledge.

It was seventy miles across. There were tall cranes built in beautiful curves, and rounded buildings, and low, wide flat-bed trucks. There were ships: four flat-nosed cylinders, and three had been opened up, the curve of the hulls broken.

"I hope you brought lights," Chmeee said.

"I do not want to be noticed yet."

"Do you find any sign of awareness? Will you land us without lights?"

"No and no," said the Hindmost. The spotlight flared from *Needle*'s nose, tremendously powerful: an auxiliary weapon, of course.

The ships were vast. An open airlock was a mere black speck. Thousands of windows glittered on the cylinders precisely like candy flecks sprinkled on a cake. One ship seemed intact. The others had been torn open and cannibalized in varying degrees, their guts opened to vacuum and prying alien eyes.

"Nothing attacks, nothing warns us," the puppeteer said.

"The temperature of the buildings and machinery is as that of the ledge and the ships, 174° Absolute. This place is long abandoned."

A pair of massive toroids, copper-colored, ringed the waist of the intact ship. They must have been a third the mass of the ship itself, or more. Louis pointed them out. "Ramscoop generators, maybe, I used the history of spaceflight once. A Bussard ramjet generates an electromagnetic field to scoop up interstellar hydrogen and guide it into a constriction zone for fusion. Infinite fuel supply. But you need an inboard tank and rocket motor for when you're moving too slow for the ramscoop. There." Tanks were visible within two of the rifled ships.

And on all three of the rifled ships, the massive toroids were missing. That puzzled Louis. But Bussard ramjets commonly used magnetic monopoles; and monopoles could be valuable in other contexts.

Something else was bothering the Hindmost.

"Tanks to carry the lead? But why not simply plate it around the ship, where it would serve as shielding before it need be transmuted into fuel?"

Louis was silent. There had been no lead.

"Availability," Chmeee said. "Perhaps they had to fight battles. Lead could be boiled from the hull, leaving the ship without fuel. Land us, Hindmost, and we will seek answers in the unharmed ship."

*Needle* hovered.

"Easy to depart," Chmeee insinuated. "Ease us off the ledge and turn off the thrusters. We fall to flat space, activate the hyperdrive and rush for safety."

*Needle* settled on the spaceport ledge. The Hindmost said, "Take your place on the stepping disks."

Chmeee did. He was not chuckling, but purring, as he vanished. Louis stepped after him and was elsewhere.

## "NOW HERE'S MY PLAN..."

**T**HE ROOM FELT FAMILIAR. He'd never seen one exactly like it, but it looked like the flight deck on any small interplanetary spacecraft. You always needed cabin gravity, a ship's computer, thrust controls, attitude jets, a mass detector. The three control chairs were recliners equipped with crash webs, controls in the arms, urinal tubes and slots for food and drink. One chair was much larger than the others, that was all. Louis felt he could fly the lander blindfolded.

There was a broad strip of wraparound window above a semicircle of screens and dials. Through the window Louis watched a section of *Needle*'s hull swing out and up. The hanger was open to space.

Chmee glanced over the larger knobs and switches set before his own chair. "We have weapons," he said softly.

A screen blinked and showed a foreshortened puppeteer head, which said, "Descend the steps to reach your vacuum equipment."

The lander's stairs were broad and shallow, made for a kzin's tread. Below was a much larger area, living space, with a water bed and sleeping plates and a kitchen the duplicate of the one in their cell. There was an autocd big enough for a kzin, with an elaborate control console. Louis had been an experimental surgeon once. Perhaps the Hindmost knew it.

Chmee had found the vacuum equipment behind one of an array of locker doors. He encased himself in what looked like an assortment of transparent balloons. He was edgy with impatience. "Louis! Gear yourself!"

Louis pulled on a flexible one-piece suit, skin-tight, and attached the fishbowl helmet and backpack. It was standard equipment; the suit would pass sweat, letting the body be its own cooling system. Louis added a loose oversuit lined in silver. It would be cold out there.

The airlock was built for three. Good: Louis could picture times when he wouldn't want to wait outside while an airlock cycled for someone else. If the Hindmost wasn't expecting emergencies he had prepared anyway. As air was replaced by vacuum, Louis's chest expanded. He pulled shut the "girdle"—the wide elastic band around his middle that would help him exhale.

Chmee strode out of the lander, out of *Needle*, into the night. Louis picked up a tool kit and followed at an easy jog.

The sense of freedom was heady, dangerous. Louis reminded himself that his suit's communication link included the Hindmost. Things had to be said, and soon, but not in the puppeteer's hearing.

Proportions were wrong here. The half-disassembled ships were too big. The horizon was too close and too sharp. An infinite black wall cut the brilliant, half-familiar starscape in half. Seen through vacuum the shapes of distant objects remained sharp and clear up to hundreds of thousands of miles away.

The nearest Ringworld ship, the intact one, looked to be half a mile distant. It was more like a mile. On the last voyage he had constantly misjudged the scale of things, and twenty-three years hadn't cured him.

He arrived puffing beneath the huge ship, to find an escalator built into one landing leg. The ancient machinery wasn't working, of course. He trudged up.

Chmee was trying to work the controls of a big airlock. He fished a grippy out of the kit Louis carried. "Best not to burn through doors yet," he said. "There is power." He pried a cover off and worked at the innards.

The outer door closed. The inner door opened on vacuum and darkness. Chmee turned on his flashlight-laser.

Louis was a little daunted. This ship would probably carry enough people to fill a small town. Easy to get lost here. "We want inspection tubes," he said. "I'd like to get the ship pressurized. With that big helmet you couldn't get into an

access tube built for men."

They turned into a corridor that curved with the curve of the hull. There were doors just taller than Louis's head. Louis opened some of the doors. He found small living cubicles with bunks and pull-down chairs for humanoids his own size and smaller.

"I'd say Hallopriplalar's people built these ships."

Chmee said, "We knew that. Her people built the Ringworld."

"That they did not do," said Louis. "I wondered if they built the ships or took them over from someone else."

The Hindmost spoke in their helmets. "Louis? Hallopriplalar told you her people built the Ringworld. Do you think she lied?"

"Yes."

"Why?"

She'd lied about other things. Louis didn't say so. He said, "Style. We know they built the cities. All those floating buildings, they're the kind of thing you put up to show off your wealth and power. Remember the Sky Castle, the floating building with the map room in it? Nessus took back tapes."

"I studied them," said the puppeteer.

"And it had a raised throne and a wire-sculpture of someone's head that was a big as a house! If you could build a Ringworld, would you bother with a Sky Castle? I don't believe it. I never believed it."

"Chmee?"

The kzin said, "We must accept Louis's judgment on human matters."

They turned right into a radial corridor. Here were more sleeping rooms. Louis inspected one in detail. The pressure suit was interesting. It was mounted against a wall like a hunter's trophy hide: one piece, crisscrossed with zippers, all open. Instantly accessible in case of vacuum.

The kzin waited impatiently while Louis zipped it shut and stepped back to study the effect.

The joints bulged. Knees and shoulders and elbows like cantaloupes, hands like a fistful of walnuts strung together. The face jutted forward; there were power and air reserve gauges set below the faceplate.

The kzin growled, "Well?"

"None, I need more proof. Let's go."

"More proof of what?"

"I think I know who built the Ringworld—and why the natives are so much like humans. But why would they build something that couldn't defend? It doesn't make sense."

"If we discussed it—"

"None, not yet. Come on."

At the ship's axis they found paydirt. Half a dozen radial corridors converged, and a tube with a ladder led up and down. There were diagrams covering four sections of wall, with labels that were tiny, detailed pictograms.

"How convenient," said Louis. "It's almost as if they had us in mind."

"Languages change," said the kzin. "These people rode the winds of relativity; their crews might be born a century apart. They would have needed such aids. We held our empire together with similar aids, before the Wars With Men. Louis, I find no weaponry section."

"There was nothing guarding the spaceport, either. Nothing obvious, anyway." Louis's finger traced the diagrams. "Galley, hospital, living area...we're here in the living area. Three control centers; seems excessive."

"One for the Bussard ramjet and interstellar space. One for fusion drive and maneuvering in an occupied system, and weapons control, if any. One for life support: this one, that shows wind blowing through a corridor."

The Hindmost spoke, "With transmutation, they would use a total conversion drive."

"Oh, not necessarily. A blast of radiation that powerful would play merry hell in an inhabited system," said Louis.

"Hah! There're our access tubes, going to...ramscop generators, fusion motor, fuel feed. We want the life support controls first. Two flights up and *that way*."

The control room was small: a padded bench facing three walls of dials and switches. A touchpoint in the door jamb caused the walls to glow yellow-white, and set the dials glowing, too. They were unreadable, of course. Pictograms segregated the controls into clusters governing entertainment, spin, water, sewage, food, air.

Louis began flipping switches. The ones most often used would be large and easy to reach. He stopped when he heard a whistling sound.

The pressure dial at his chin rose gradually.

There was low pressure at 40% oxygen. Humidity was low but not absent. No detectable noxious substances.

Chmeee had deflated his suit and was stripping it off. Louis removed his helmet, dropped the backpack, and peeled his suit away, all in unseemly haste. The air was dry and faintly stale.

Chmeee said, "I think we may start with the access tube to the fuel feed. Shall I lead?"

"Fine," Louis heard in his voice the tension and eagerness he'd tried to repress. With luck, the Hindmost would miss it. Soon, now. He followed the kzin's orange back.

Out the door, turn right into a radius, follow to the ship's axis and down a ladder, and a great furry hand engulfed Louis's upper arm and pulled him into a corridor.

"We must talk," the kzin rumbled.

"Yah, and about time, too! If he can hear us now we might as well give up. Listen—"

"The Hindmost will not hear us. Louis, we must capture *Hot Needle of Inquiry*. Have you given thought to this?"

"I have. It can't be done. You made a nice try, but what the futz were you going to do next? You can't fly *Needle*. You saw the controls."

"I can make the Hindmost fly it."

Louis shook his head. "Even if you could stand guard over him for two years, I think the life support system would break down, trying to keep you both alive that long. That's the way he planned it."

"You would surrender?"

Louis sighed. "All right, let's look at it in detail. We can offer the Hindmost a credible bribe or a credible threat; or we can kill him if we think we can fly *Needle* afterward."

"Yes."

"We can't bribe him with a magic transmutation device. There isn't any."

"I dreaded that you would blurt out the truth."

"No way. Once he knows we aren't needed, we're dead. And we don't have any other bribes." Louis continued, "We can't get to the flight deck. There may be stepping disks that would take us there, somewhere aboard *Needle*, but where are they and how do we get the Hindmost to turn them on? We can't attack him, either. Projectiles won't go through a GP hull. There's flare shielding on the hull, and probably more flare shielding between our cell and the flight deck. A puppeteer wouldn't have ignored that. So we can't fire a laser at him because the walls would turn mirror-colored and bounce the beam back at us. What's left? Sonics? He just turns off the microphones. Have I left anything out?"

"Antimatter. You need not remind me that we have none."

"So we can't threaten him, we can't hurt him, and we can't reach the flight deck anyway."

The kzin clawed thoughtfully at the ruff around his neck.

"It just occurred to me," Louis said. "Maybe *Needle* can't get back to known space at all."

"I don't see what you mean."

"We know too much. We're very bad publicity for the puppeteers. Odds are the Hindmost never planned to take us home. Well, why would he go himself? The place he wants to

reach is the Fleet of Worlds, which is twenty or thirty light years from here by now, in the opposite direction. Even if we could fly *Needle*, we probably don't have the life support to reach known space."

"Shall we steal a Ringworld ship, then? This one?"

Louis shook his head. "We can look it over. But even if it's in good shape, we probably can't fly it. Harloprillalar's people took crews of a thousand, and they never went that far—according to Prill—though the Ringworld engineers probably did."

The kzin stood peculiarly still, as if afraid to release the energy bottled inside him. Louis began to realize how angry Chmeee was. "Do you counsel me to surrender, then? Is there not even vengeance for us?"

Louis had thought this through, over and over, while under the wire. He tried to remember the optimism he'd felt then; but it was gone. "We stall. We search the spaceport ledges. When we don't find anything, we search the Ringworld itself. We're equipped for that. We can't let the Hindmost give up till we find our own answer. Whatever it might be."

"This situation is entirely your fault."

"I know. That's what makes it so funny."

"Laugh, then."

"Give me my droud and I'll laugh."

"Your foolish speculations have left us slave to a mad root eater. Must you always pretend to more knowledge than is yours?"

Louis sat down with his back to a yellow-glowing wall. "It seemed so reasonable. Tanji, it was reasonable. Look: the puppeteers were studying the Ringworld years before we came on the scene. They knew its spin and its size and its mass, which is just more than the mass of Jupiter. And there's nothing else in the system. Every planet, every moon, every asteroid—gone. It seemed so obvious. The Ringworld engineers took a Jupiter-style planet and made it into building materials, and they used the rest of the planetary garbage, too, and they built it all into a Ringworld. The mass of, say, Sol System would be just about right."

"It was only speculation."

"I convinced you both. Remember that. And gas giant planets," Louis continued doggedly, "are mostly hydrogen. The Ringworld engineers would have had to convert hydrogen into Ringworld floor material—whatever that stuff is, it's like nothing we ever built. They would have had to transmute material at a rate that would outstrip a supernova. Listen, Chmeee, I'd seen the *Ringworld*. I was ready to believe anything."

"And so was Nessus." The kzin snorted, forgetting that he too had believed. "And Nessus asked Harloprillalar about transmutation. And she thought our two-headed companion was charmingly gullible. She told him that tale of Ringworld starships carrying lead to transmute into fuel. Lead! Why not iron? Iron would bulk more, but its structural strength would be greater."

Louis laughed. "She didn't think of it."

"Did you ever tell her that transmutation was your hypothesis?"

"What do you think? She'd have laughed herself to death. And it was too late to tell Nessus. By then Nessus was in the autodoc with one head missing."

"Urur."

Louis tried to rub his aching shoulders through the helmet. It didn't work. "One of us should have known better. I told you I did some math after we got back. Do you know how much energy it takes to spin the mass of the Ringworld up to seven hundred and seventy miles per second?"

"Why do you ask?"

"It takes a lot. Thousands of times the yearly energy output of this kind of sun. Where would the Ringworld engineers get all that energy? What they had to do was disassemble a dozen Jupiters, or a superjovian planet a dozen times Jupiter's

mass—all mostly hydrogen, remember. They'd use some of the hydrogen in fusion for the energy to run that project, and reserve more of it in magnetic bottles. After they made the Ringworld from the solid residues, they'd have fuel for fusion rockets to spin it up to speed."

"Hindsight is so wonderful," Chmeee growled back and forth along the corridor on his hind legs, like a man, deep in thought. "So we are slaved to a mad alien searching for a magical machine that never was. What do you hope will happen in the year left to us?"

It was difficult to be optimistic without current. "We explore. Transmutation or not, there's got to be something valuable on the Ringworld. Maybe we'll find it. Maybe there's a United Nations ship already here. Maybe we'll find a thousand-year-old Ringworld spaceship crew. Maybe the Hindmost will get lonely and let us join him on the flight deck."

The kzin paced with his tail switching back and forth. "Can I trust you? The Hindmost controls the current flow to your brain."

"I'll kick the habit."

The kzin snorted.

"Finagle's festering testicles! Chmeee, I'm two and a quarter centuries old. I've been *everything*. I've been a master chef. I helped build and operate a Wheel City above Down. I settled on Home for awhile and lived like a colonist. Now I'm a wirehead. Nothing lasts. You can't do any one thing for two hundred years. A marriage, a career, a hobby: they're good for twenty years, and maybe you go through a phase more than once. I did some experimental medicine. I wrote a big chunk of that documentary on the Rinoc culture, that won a—"

"Current addiction involves the brain directly. It's different, Louis."

"Yah. Yah, it's different." Louis felt the depression like a wall of black jelly sagging inward, crushing him down. "It's all black or all white. The wire is sending or it isn't. There's no variety. I'm sick of it. I was sick of it before the Hindmost took over my current flow."

"But you did not give up the droud."

"I want the Hindmost to think I can."

"You want me to think you can."

"Yah."

"What of the Hindmost? Never have I heard of a puppeteer who behaved so strangely."

"I know. It makes me wonder if all the mad traders were Nessus's sex. If the—call them sperm-carrying males—are the dominant ones."

"Ur—"

"It doesn't have to be that way. The kind of madness that sends a puppeteer to Earth because he can't deal with other puppeteers—that's not the same as the madness that makes a Josef Stalin. What do you want from me, Chmeee? I don't know how he'll act. If we give him some credit for brains, then he'll use General Products trading techniques. It's the only way he knows to deal with us."

The canned air tasted cool and metallic. There was too much metal in these ships, Louis thought. It seemed queer that Halrolpirillalar's people hadn't used more advanced materials. Making a Bussard ramjet was no task for primitives.

The air smelled funny, and the yellow-white glow in the walls dimmed and brightened irregularly. Best get back to their pressure suits, soon.

Chmeee said, "There is the lander. It would function as a spacecraft."

"What do you call a spacecraft? It must have interplanetary capability. It'd need that to get around on the Ringworld. I wouldn't think we could reach another star with it."

"I was thinking of ramming *Needle*. If there is no escape, we may take vengeance."

Larry Niven

"That'd be fun to watch. You ramming a General Products hull."

The kzin loomed over him. "Do not be too amusing, Louis. What would I be on the Ringworld, with no mate, no land, no name, and a year to live?"

"We'd be buying time. Time to find a way off. In the meantime—" Louis stood up. "Officially, we're still searching for a magic transmutation machine. Let's make at least a token search."

## DECISION POINT



OUIS WOKE, RAVENOUS. He dialled a Cheddar cheese soufflé and Irish coffee and blood-oranges and ate his way through it all.

Chmeee slept, curled protectively around himself. He looked different somehow. Neater—yes, neater, because the scar tissue under his fur had disappeared and the new fur was growing out.

His stamina was impressive. They had searched every one of the four Ringworlder ships, then moved on to a long, narrow building at the very lip of infinity, which proved to be the guidance center for the spacecraft accelerator system. At the last Louis was moving in a fog of exhaustion. He knew he should have been examining *Needle* for details for construction, weak points, routes into the flight deck. Instead he had watched Chmeee, with hatred. The kzin never stopped to rest.

The Hindmost appeared from somewhere, from behind or within the green-painted private sector. His mane was combed and fluffy, dressed with crystals that changed their spectral color as he moved. Louis was intrigued. The puppeteer had been scruffy while he was flying *Needle* alone. Did he dress to impress his alien prisoners with his elegance?

He asked, "Louis, do you want the droud?"

Louis did, but—"Not yet."

"You slept eleven hours."

"Maybe I'm adjusting to Ringworld time. Did you get anything done?"

"I took laser spectrograms of the ships' hulls. They are largely iron alloys. I have deep-radar scans, two views each for the four ships; I moved *Needle* while you slept. There are two more spaceport ledges 120° around the Ringworld. I located eleven more ships by their hull composition. I could not learn detail at this distance."

Chmeee woke, stretched, and joined Louis at the Transparent wall. "We learn only to ask more questions," he said. "One ship was left intact, three were stripped. Why?"

"Perhaps Halrolpirillalar could have told us," the Hindmost said. "Let us deal with the only urgent question. Where is the transmutation device?"

"We have no instruments here. Flick us to the lander, Hindmost. We will use the screens on the flight deck."

Eight screens glowed around the horseshoe curve of thelander's instrument board. Chmeee and Louis studied ghostly schematics of the Bussard ramjet ships, generated by the computer from the deep-radar scans.

"It looks to me," Louis said, "like one team did the entire looting job. They had three ships to work with, and they took what they wanted most first. They kept working till something stopped them: they ran out of air or something. The fourth ship came later. Mmm...but why didn't the fourth crew loot their own ship?"

"Trivialities. We seek only the transmutor. Where is it?"

Chmeee said, "We could not identify it."

Louis studied the deep-radar ghosts of four ships. "Let's be methodical. What isn't the transmutation system?" He traced lines on the image of the one intact ship, using a light-pointer. "Here, these paired toroids circling the hull have to be the ramscoop field generators. Fuel tanks here. Access tubes

GALILEO 69

here, here, here . . ." As he pointed them out the Hindmost obliged by removing sections of ship from the screen. "Fusion reaction motor, this whole section. Motors for the landing legs. Take out the legs, too. Attitude jets here, here, here, all fed by tubes along here carrying plasma from the one small fusion generator, here. Battery. This thing with the snout, pointing out of the middle of the hull—what did Prill call it?"

"*Cziltang brone*," Chmeee sneezed. "It softens the Ringworld floor material temporarily, for penetration. They used it instead of airlocks."

"Right." Louis continued, with enthusiasm and hidden glee. "Now, they probably wouldn't keep the magic transmutor in the living quarters, but . . . sleeping rooms here, control rooms here, here, here, the kitchen—"

"Could that be—?"

"No, we thought of that. It's just an automated chemistry lab."

"Proceed."

"Garden" area here. Sewage treatment feeds in. Airlocks . . ."

When Louis had finished, the ship was gone from the screen. The Hindmost patiently restored it. "What did we overlook? Even if the transmutor was dismounted, removed, there would be space for it."

This was getting to be fun. "Hey, if they really kept their fuel outside—lead, molded around the hull—then this isn't really an inboard hydrogen tank, is it? Maybe they kept the magic transmutor in there. It needed heavy padding or heavy insulation . . . or cooling by liquid hydrogen."

Chmeee asked, before the Hindmost could, "How would they remove it?"

"Maybe with the *cziltang brone* for another ship. Were all the fuel tanks empty?" He looked at the ghosts of the other ships. "Yah. Okay, we'll find the transmutors on the Ringworld—and they won't be working. The plague will have got to them."

"Haloprillilar's talk of the bacterium that eats superconductor is in our records," the Hindmost said.

"Well, she really couldn't tell us all that much," said Louis. "Her ship left on a long tour. When it came back there was no more Ringworld civilization. Everything that used superconductors had stopped." He had wondered how much to believe of Prill's tale of the Fall of the Cities. But something had destroyed the Ringworld's ruling civilization. "Superconductor is almost too wonderful. You end up using it in everything."

"Then we can repair the transmutors," said the Hindmost.

"Oh?"

"You will find superconducting wire and fabric stored aboard the lander. It is not the same superconductor the Ringworld used. The bacterium will not touch it. I thought we might need trade goods."

Louis kept his poker face intact; but the Hindmost had made a startling statement. How did puppeteers come to know so much about a mutant plague that killed Ringworld machines? Suddenly Louis didn't doubt the bacterium at all.

Chmeee hadn't caught it. "We want to know what the thieves used for transportation. If the rim wall transport system failed, then our transmutors may be just the other side of the rim wall, abandoned there because they stopped working."

Louis nodded. "Failing that, we've got a lot of territory to search. I think we should be looking for a Repair Center."

"Louis?"

"There has to be a Control and Maintenance Center somewhere. The Ringworld can't run itself forever. There's meteor defense, meteor repair, the attitude jets—the ecology could go haywire—it all has to be watched. Of course the Repair Center could be anywhere. But it's got to be big. We shouldn't have that much trouble finding it. And we'll

probably find that it's been abandoned, because if anyone were minding the store, he wouldn't have let the Ringworld slide off center."

The Hindmost said, "You have been putting your mind to this."

"We didn't do too well the first time we came here. We came to explore, remember? Some kind of laser weapon shot us down, and we spent the rest of our time trying to get off alive. We covered maybe a fifth of the width, and learned just about nothing. It's the Repair Center we should have been looking for. That's where the miracles are."

"I had not expected such ambition from a current addict."

"We'll start cautiously." Cautionously for humans, Louis told himself; not for puppeteers. "Chmee's right: the machines could have been dumped as soon as they were through the rim wall, when the bacterium got to them."

Chmeee said, "We should not try to take the lander through the rim wall. I have no faith in an alien machine a thousand years old. We must go over."

The Hindmost asked, "How would you avoid the meteor defense?"

"We must try to outguess it. Louis, do you still believe that what fired on us was merely an automated defense against meteors?"

"I thought so at the time. It all happened so tanj fast." *Falling sunward, all a little edgy, daunted by the reality of the Ringworld. All but Teela, of course. A momentary flash of violet-white; then Liar was embedded in tenuous, violet-glowing gas. Teela had looked out through the hull. "The wing's gone," she'd said.*

"It didn't fire on us till we were on a course to intersect the Ringworld surface. It's got to be automated. I told you why I think there's nobody in the Repair Center."

"Nobody to fire on us deliberately. Very well, Louis. Automatics would not be set to fire on the rim transport system, would they?"

"Chmee, we don't know who built the rim transport system. Maybe it wasn't the Ringworld engineers; maybe it was added later, by Prill's people—"

"It was," said the Hindmost.

His crew turned to look at the puppeteer's image on the screen.

"Did I tell you that I spent some time at the telescope? I have learned that the rim transport system is only partly finished. It runs along 40% of this rim wall, and does not include the section we occupy now. On the portward rim wall the system is only 15% complete. The Ringworld engineers would not have left so minor a subsystem half-built, would they? Their own mode of transport may have been the same spacecraft used to supervise construction."

"Prill's people came later," Louis said. "Maybe a lot later. Maybe the rim transport system got too expensive. Maybe they never actually completed their conquest of the Ringworld . . . but then why were they building starships? Oh, futz, we may never know. Where does this leave us?"

"It leaves us trying to outthink the meteor defense," Chmeee said.

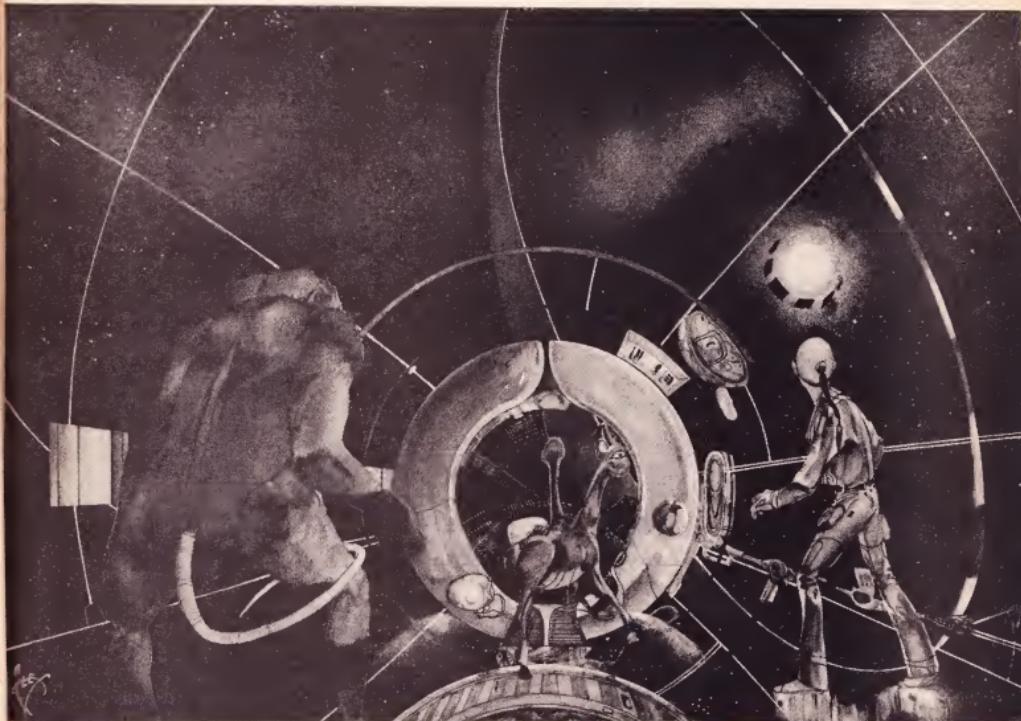
"Yah. And you were right. If the meteor defense made a habit of firing on the rim wall, nobody would have built anything there." Louis chewed it a moment longer. There could be holes in his assumptions, but the alternative was to go through the wall via an ancient *cziltang brone* of unknown dependability. "Okay. We fly over the rim wall."

The puppeteer said, "You suggest a fearful risk. I prepared as best I could, but I was forced to use human technology. Suppose the lander should fail? I hesitate to risk any of my resources. You would be stranded. The Ringworld is doomed."

"I hadn't forgotten," Louis said.

"First we must search all of the spaceport ledges. There are eleven more ships on this rim wall, and an unknown

THE RINGWORLD ENGINEERS



number on the portward rim."

And it would be weeks before the Hindmost satisfied himself that no transmutation system was to be found on those ships. Oh, well.

"We should go now," Chmeee said. "The secret may be nearly within our grip!"

"We have fuel and supplies. We can afford to wait."

Chmeee reached out and tapped controls. He must have planned this sequence in detail; he must have studied the lander minutely while Louis was dozy with fatigue. The small conical craft lifted a foot from the floor, spun ninety degrees, and the blast of a fusion motor filled the docking chamber with white fire.

"You are being foolish," the Hindmost's liquid contralto reproved them. "I can turn off your drive."

The lander slid clear of the curved docking hatch and lifted at a brutal four gees. When the Hindmost finished speaking a fall would already have killed them. Louis cursed himself for not foreseeing this. Chmeee's blood was bubbling with youth. Half the kzinti never grew up, they died in fights.

And Louis Wu, too engrossed in himself and his current-withdrawal depression, had let his options slip by him.

He asked coolly, "Have you decided to do your own exploring, Hindmost?"

The puppeteer's heads quivered indecisively above his control board.

"No? Then we'll do it our way, thank you very much." Louis turned to Chmeee and said. "Try landing on the rim

Larry Niven

wall," before he noticed the kzinti's peculiarly rigid attitude, blank eyes, and exposed claws. Rage? Would the kzinti actually try to ram *Hot Needle of Inquiry*?

The kzinti howled in the Hero's Tongue.

The puppeteer answered in the voice of a kzinti; changed his mind and repeated in Interworld. "Two fusion rockets, one mounted aft and one beneath. No thrusters. You need never fire the fusion motors on the ground except for defense. You may lift with repulsors, which repel the Ringworld floor material. You may fly as if using a negative gravity generator, but the repulsors are simpler in design, easier to repair and maintain. Do not use them now. They would repel the rim wall and thrust you into space."

That explained Chmeee's apparent panic. He was having trouble flying the lander. Not reassuring. But the spaceport ledge was far below, and an unnerving wobble at takeoff had almost disappeared. There was steady four-gee thrust under him—which suddenly cut off. Louis said, "Wuff!" as the lander went into free fall.

"We must not rise too far above the rim wall. Search the lockers, Louis. Inventory our equipment."

"You'll warn me before you do that again?"

"I will."

Louis disengaged the crash web and floated down the stairwell.

Here was living space surrounded by lockers and an airlock. Louis began opening doors. The biggest locker held what must have been a square mile of fine, silky black cloth, and hundreds of miles of black thread on twenty-mile spools.

Another locker held modified flying belts, with repulsors over the shoulders and a small thruster. Two small and one large. One for Hailropillalar, of course. Louis found flashlight-lasers and hand-held sonic stunners and a heavy two-handed disintegrator. He found boxes the size of Chmeee's fist, with a shirt clip and a microphone grid, and ear plugs (two small and one large) in the same compartment. Those would be translators, with compact computers included. If they worked through the onboard computer they would have been less bulky.

There were large rectangular repulsion plates—for towing cargo through the air? Spools of Sinclair molecule chain, like very thin, very strong thread. Small bars of gold: for trade? Binocular goggles with a light-amplification setting. Impact armor. Louis muttered, "He's thought of everything."

"Thank you." The Hindmost spoke from screen Louis hadn't noticed. "I had many years to prepare."

Louis was getting tired of finding the Hindmost wherever he went. Funny, he could hear the sounds of a catfight drifting down from the flight deck. The Hindmost must be holding two conversations at once, instructing Chmeee on the lander's controls. He heard the expression for "attitude jets."

Chmeee's voice roared without benefit of microphone. "Louis, take your place!"

Louis glided up the stairwell. He was barely into his chair when Chmeee lit the fusion motors. The lander slowed and hovered just at the edge of the rim wall.

The top of the rim wall was broad enough for the lander, but not much more than that. And how was the Ringworld meteor defense taking all this?

*They had been within the arc of the Ringworld, falling toward the inner ring of shadow squares, when violet light bathed the spacecraft Flying Bastard. Liar's hull had instantly enclosed itself in a bubble of no-time. When time began again, the hull and its occupants had suffered no damage. But Liar's delta wing, with its thrusters and fusion motors and pods of sensing instruments, had become ionized vapor. And the hull was falling toward the Ringworld.*

*They had speculated, later, that the violet laser was no more than an automated meteor defense. They had guessed that it might be based on the shadow squares. It was all guesswork; they had never learned anything about the Ringworld weapon.*

The rim transport system was a late addition. The Ringworld engineers would not have taken it into account when programming the meteor defense. But Louis had seen old recordings of it in action, in a building abandoned by Hailropillalar's species. It had worked; the meteor defense had not fired on the linear accelerator loops or the ships they enclosed. And Louis gripped his chair arms hard, waiting for violet flame, as Chmeee settled the lander on the rim wall.

But it didn't come.

## RINGWORLD

**F**ROM A THOUSAND MILES ABOVE the Earth—from, say, a space station in a two-hour orbit—the Earth is a great sphere. The kingdoms of the world revolve below. Details disappear around the horizon's curve; other, hidden features rotate into view. At night, glowing cities outline the continents.

But from a thousand miles above the Ringworld, the world is flat, and the kingdoms thereof are all there at once.

The rim wall was the same stuff as the Ringworld floor. Louis had walked on it, in places where eroded landscape let it show through. It had been greyish, translucent, and terribly slippery. Here the surface had been roughened for traction. But the pressure suit and backpack made Chmeee and Louis top-heavy. They moved with care. That first step would be a beauty.

At the bottom of a thousand miles of glassy cliff were broken layers of cloud, and seas: bodies of water from ten thousand to a couple of million square miles in area, spread more or less uniformly across the land, and linked by networks of rivers. As Louis raised his eyes they grew smaller with distance—smaller and a little hazy—too small to see, until sea and fertile land and desert and cloud all blended into a blue knife-edge against black space.

To left and right it was the same, until the eye found a blue band swooping up from the infinity beyond the horizon. The Arch rose and narrowed and curved over and above itself, baby-blue checked with midnight blue, to where a narrow ribbon of Arch lost itself behind a shrunken sun.

This part of the Ringworld had just passed its maximum distance from the sun; but a Sol-type star could still burn your eyes out. Louis blinked and shook his head, his eyes and mind dazzled. Those distances could grab your mind and hold it, leave you looking into infinity for hours or days. You could lose your soul to those distances. What was one man, when set against an artifact so huge?

He was Louis Wu. There was nothing like him on all the Ringworld. He held to that. Forget the infinites: concentrate on detail.

There, thirty-five degrees up the Arch: a faintly bluer patch.

Louis worked the magnification on his goggles. They locked onto the faceplate, but you had to hold your head very still. The patch was all ocean, an ellipse stretching nearly across the Ringworld, with clusters of islands showing through cloud cover.

He found the other Great Ocean higher up on the other branch of the Arch. It was a ragged four-pointed star, dotted with similar clusters of tiny islands—tiny at this distance, at which the Earth would be a naked-eye object, barely.

It was getting to him again. Deliberately he looked down, studying the near distance.

Almost below, a couple of hundred miles to spinward, a half-cone of mountain leaned drunkenly against the rim wall. It seemed oddly regular. It was layered in half-circles: a bare dirt-colored peak; far below, a band of white, probably snow and ice; then green spreading down and out into foothills.

The mountain was quite isolated. In the spinward direction the rim wall was a flat vertical cliff out to the limit of the binocular goggles—almost. If that bump at the very limit of vision was another such mountain, it was a fuzz of a long way away. At that distance you could almost see the Ringworld starting to curve upward.

There was another such bump in the antispinward direction. Louis scowled. *File for future study.*

Far to port (ahead) and a bit to spinward (right) was a region of glittering white, brighter than land, brighter than sea. A midnight-blue edge of night was sweeping toward it. Salt, was Louis's first thought. It was big. It had engulfed a couple of dozen Ringworld seas, and those seas varied from Lake Huron to Mediterranean in size. Brighter points came and went like ripples.

Ah, "Sunflower patch."

Chmeee looked. "The one that burned me was bigger." Slaver sunflowers were as old as the Slaver Empire, which had died more than a billion years ago. The Slavers seemed to have planted sunflowers around their estates, for defense. You still found these plants on some of the worlds of known space. Cleaning them out was a difficult business. You couldn't just burn them out with laser cannon. The silver blossoms would throw the beam back at you.

What sunflowers were doing on the Ringworld was a mystery. But Speaker-to-Animals had been flying above a Ringworld landscape when a rift in the clouds exposed him to the plants beneath. The scars were almost gone.

Louis raised the magnification on his goggles. A smoothly curved borderline marked off the blue-green-brown of an Earthlike world from the silver sunflower patch. The border

curved inward to half-enclose one of the larger seas.

"Louis? Look for a short black line, just beyond the sunflowers and a bit to antispinward."

"I see it." A black dash on the infinite noonday landscape, perhaps a hundred thousand miles from where they stood. Now, what would that be? A vast tar pit? No, petrochemicals would never form on the Ringworld. A shadow? What could cast a shadow in the Ringworld's permanent noon?

"Chmeee, I think it's a floating city."

"Yes... At worst it will be a center of civilization. We should consult them."

They had found floating buildings in some of the old cities. Why not a floating city? They'd be seeing it edge on, of course.

"What we should do," Louis said, "is touch down a fair distance away and ask the natives about them. I'd hate to come on them cold. If they're good enough to keep that city going, they could be tough. Say we touch down near the edge of the sunflower patch—"

"Why there?"

"The sunflowers would be fouling up the ecology. Maybe the locals could use some help. We'd be surer of our welcome. Hindmost, what do you think?"

There was no answer.

"Hindmost? Calling the Hindmost... Chmeee, I think he can't hear us. The rim wall's blocking his signals."

Chmeee said, "We will not remain free long. I saw a pair of probes mounted in the cargo bay, behind the lander. The puppeteer will use them as relays. Is there anything you would like to say during this temporary freedom?"

"I'd say we covered it all last night."

"Not quite. Our motives are not quite the same, Louis. I take it that you are eager to save your life. Beyond that you want free access to current. For myself, I want my life and my freedom, but I also want satisfaction. The Hindmost has kidnapped a kzin. He must be made to regret it."

"I can buy that. He kidnapped me, too."

"What does a wirehead know of thwarted honor? Do not let me find you blocking my path, Louis."

"I'm just going to diffidently remind you," Louis said, "that I got you off the Ringworld. Without me you would never have taken the *Long Shot* home to earn your name."

"You were not a current addict then."

"I am not a current addict now. And don't you call me a liar."

"I am not ac—"

"Hold it." Louis pointed. The corner of his eye had caught something moving against the stars. A moment later the voice of the Hindmost spoke in their ears.

"Please forgive the hiatus. What have you decided to do?"

"Explore," Chmeee said curtly. He turned back to the lander.

"Give me details. I am not happy about risking one of my probes merely to maintain communications. The primary purpose of these probes was to refuel *Needle*."

"Return your probe to safety," Chmeee told the puppeteer. "When we return we will report in full."

The probe settled onto the rim wall on several small jets. It was a lumpy cylinder twenty feet long. The Hindmost said, "You speak frivulously. It is my landing craft you risk. Do you plan to search the base of the rim wall?"

That thrilling contralto, that lovely woman's voice, was the same that every puppeteer trader had learned from his predecessor. Possibly they learned another to influence women. To men it was a voice that pushed buttons, and Louis resented that. He said, "There are cameras on the lander, aren't there? Just watch."

"I have your droud. Explain."

Neither Louis nor Chmeee bothered to answer.

"Very well. I have locked open the stepping disk link between the lander and *Needle*. The probe will function as a

relay for this, too. As for your droud, Louis, you may have it when you learn to obey."

And that, thought Louis, defined his problem nicely.

Chmeee said, "It is good to know that we can flee our mistakes. Are there range limits to stepping disks?"

"Energy limits. The stepping disk system can absorb only a limited kinetic energy difference. *Needle* and the lander should have no relative velocity when you flick across. You are advised to stay directly to port of *Needle*."

"This fits our plans."

"But if you abandon the lander, I still control your means of escape from the Ringworld. Do you hear me, Chmeee, Louis? The Ringworld will impact the shadow squares in just more than Earth's year."

Chmeee lifted the lander on puppeteer-developed repulsors. A burst from the aft fusion motor edged the craft forward and off the edge.

Flying on Ringworld floor material repulsors was *not* like using antigravity, Louis noted. Repelled by both the rim wall and the landscape, the lander fell in a swooping curve. Chmeee stopped their descent at forty miles.

Louis displayed a telescope view on one of the screens. Floating on repulsors alone, above most of the atmosphere, the lander was very steady and utterly quiet: a good telescope mount.

Rocky soil lapped up in foothills to the base of the rim wall. Louis ran the telescope along that border, slowly, at high magnification. Barren brown soil against glassy grey. An anomaly would be easy to spot.

"What do you expect to find?" Chmeee asked.

Louis didn't mention the watching puppeteers who thought they were searching for an abandoned transmutation device. "A spacecraft crew would have come through from the spireport ledge about here. But I don't see anything big in the way of abandoned machinery. We really aren't interested in little stuff, are we? They wouldn't have left anything valuable unless it was just too tanj big to move, and then they'd have left almost everything they had."

He stopped the telescope. "What do you make of that?"

It stood thirty miles tall against the base of the rim wall: a half-cone, with a weathered look, as if smoothed by a hundred million years of wind. Ice glittered in a broad belt around its lower slope. The ice was thick and showed the flow patterns of glaciars.

"The Ringworld imitates the topography of Earthlike worlds," said Chmeee. "From what I know of Earthlike worlds, this mountain doesn't fit the pattern."

"Yah. It's inartistic. Mountains come in chains, and they aren't this regular. But, you know, it's worse than that. Everything on the Ringworld is contoured in. Remember when we took the *Liar* underneath? Sea bottoms bulging, dents for mountains and gullies for mountain ranges, river beds like veins in a weight lifter's arm? Even the river deltas are carved into the structure. The Ringworld isn't thick enough to let the landscape carve itself."

"There are no tectonic processes to do the carving, for that matter."

"Then we should have seen that mountain from the back, from the spaceport. I didn't. Did you?"

That turned out to be difficult. The closer the lander came to the rim wall, the more fusion thrust was needed to hold it there—or to lift the lander if the repulsors were turned off.

They came within fifty miles; and that was close enough to find the city. Great gray rocks protruded through the ice flows; and some of these showed myriad of black shadowed doors and windows. Focus closer and the doorways had balconies and awnings, and there were hundreds of slender suspension bridges running up, down, and sideways. Stairways were hacked into the rock; they ran in strange branching curves, half a mile tall and more. One dipped all

the way to the foothills, to the tree line.

A fortuitous flat space in the center of the city, half rock and half permafrost, had become a public square; the hordes that thronged it were pale golden flecks just big enough to see. Golden clothing, or golden fur? Louis wondered. A great boulder at the back of the square had been carved with the face of a hairy, chubby, jovial baboon.

Louis said, "Don't try to get closer. We'll scare them away if we try to land on fusion drive, and there isn't any other way."

A vertical city with a population of ten thousand, at a guess. Deep-radar showed that they had not dug deep into the rock. In fact, those rocks riddled with rooms looked like dirty permafrost.

"Surely we want to question them regarding their peculiar mountain?"

"I'd love to talk to them," Louis said, and he meant it. "But look at the spectrograph and deep-radar. They don't use metals or plastics, let alone single-crystal stuff. I hate to think what those bridges are made of. They're primitives. They'll think they're living on a mountain."

"I agree. Too much trouble to reach them. Where next? The floating city?"

"Yah, by way of the sunflower patch."

A shadow square was sliding across the sun's disk.

Chmeee lit the aft motor again and ran their speed to ten thousand miles per hour, then coasted. Not too fast for detail, but fast enough to get them where they were going in about ten hours. Louis studied the racing landscape.

In principle the Ringworld should have been an endless garden. It was not a randomly evolved world, after all, but a made thing.

What they had seen on their first visit could not be considered typical. They had spent most of their time between two big meteoroid punctures: between the Eye Storm, which was spewing air through a puncture in the Ringworld floor, and the stretched and raised landscape around Fist-of-God Mountain. Of course the ecology was damaged. The engineers' carefully planned wind patterns must have been ruined.

But here? Louis looked in vain for the pattern of an Eye Storm, a hurricane turned on its side and flattened. There were no meteoroid punctures here. Yet there were patches of desert, Sahara-size and larger. On the ridges of mountain ranges he found the pearly gleam of naked Ringworld foundation. Winds had stripped away the covering rock.

Had the weather patterns grown this bad, this fast? Or did the Ringworld engineers *like* deserts? It struck Louis that the Repair Center must have been deserted for a very long time. Halflorplillalar's people might never have found it at all, after the Ringworld engineers vanished. As they had to have vanished, if Louis's guess was right.

"I want three hours' sleep," Chmeee said. "Can you fly the lander if something happens?"

Louis shrugged. "Sure, but what could happen? We're too low for the meteor defense. Even if it's based on the rim wall, it'd be firing on settled land. We'll just cruise awhile."

"Yes. Wake me in three hours." Chmeee reclined his chair and slept.

Louis turned to the fore and aft telescopes for amusement and instruction. Night had covered the sunflower region. He ran the view up along the Arch to the nearer of the Great Oceans.

There, to 'spinward of the ocean and almost on the Ringworld median line: that tilted mock-volcano was Fist-of-God Mountain, in a patch of Mars-colored desert much bigger than Mars. Further to port, a reaching bay of the Great Ocean, itself bigger than worlds.

They had reached the shore of that bay and turned back, last time.

74 GALILEO

The islands were scattered in clusters across the blue ellipse. One was a single island, disk-shaped, desert-colored. One was a disk with a channel cut through it. Strange. But the others were islands in a vast sea—there, he had found the map of Earth: America, Greenland, Eurasiafrica, Australia, Antarctica, all splayed out from the glare-white north pole, just as he had seen it in the Sky Castle long ago.

Were they *all* maps of real worlds? Prill wouldn't have known. The maps must have been made long before her species came on the scene.

He had left Teela and Seeker somewhere in there. They must still be in the area. Given Ringworld distances and native technology, they could not have gone far in twenty-three years. They were thirty-five degrees up the curve of the Arch—fifty-eight million miles away.

Louis really didn't want to meet Teela again.

Three hours had passed. Louis reached out and shook Chmeee's shoulder, gently.

A great arm lashed out. Louis threw himself backward, not far enough.

Chmeee blinked at him. "Louis, never wake me like that. Do you want the autodoc?"

There were two deep gashes just behind his shoulder. He could feel blood seeping into his shirt. "In a minute. Look." He pointed at the map of Earth, tiny islands well separated from the other clusters.

Chmeee looked. "Kzin."

"What?"

"A map of Kzin. There. Louis, I think we were wrong when we assumed that these were miniature maps. They are full size, one-to-one scale."

Half a million miles from the map of Earth was another cluster. As with the Earth map, the oceans were distorted by the polar projection, but the continents were not. "That is Kzin," Louis said. "Why didn't I notice? And that disk with a channel cut through it, that's Jinx. The smaller red-orange blob must be Mars." Louis blinked away dizziness. His shirt was wet with blood. "We can take this up later. Help me down to the autodoc."

## THE HERDSMEN



E SLEPT IN THE AUTODOC.

Four hours later—with a trace of tightness behind and below his shoulder to remind him never to touch a sleeping kzin—Louis took his seat.

It was still night outside. Chmeee had the Great Ocean on the screen. He asked, "How are you?"

"Restored to health, thanks be to modern medicine."

"You were not distracted by your wounds. Yet there must have been pain and shock."

"Oh, I suppose Louis Wu at fifty would have gone into hysterics, but futz, I knew the autodoc was right there. Why?" "It seemed to me at first that you must have the courage of a kzin. Then I wondered if current addiction has left you unable to respond to any lesser stimulus."

"We'll just assume it's courage, okay? How are you making out?"

"Well enough." The kzin pointed. "Earth. Kzin. Jinx; the two peaks rise right out of the atmosphere, as do the East and West Poles of Jinx. So does the Map of Mars. This is Kdat, the slave planet—"

"Not any more."

"The kdatlyno were our slaves. So were the pierin, and this is their world, I think. Here, you would know: is this the home world of the Trinocs?"

"Yah, and they'd settled this one next to it, I think. We can ask the Hindmost if he's got maps."

"We can be sure enough."

"Granted. Okay, what is it? It's *not* a roster of Earthlike worlds. And there are half a dozen I can't identify at all."

THE RINGWORLD ENGINEERS

Chmeee snorted. "Obvious to the meanest intelligence, Louis. It is a roster of potential enemies, intelligent or near-intelligent beings who may one day threaten the Ringworld. Pierin, kzinti, martians, human, Trinoc."

"But where does Jinx fit it? Oh. Chmeee, they couldn't have thought the bandersnatchi might come at them with warships. They're big as dinosaurs, and handless. And Down has intelligent natives, too. So where is it?"

"There."

"Yah. That's kind of impressive. The grogs aren't all that obvious a menace. They spend their whole lives sitting on one rock."

The Ringworld engineers found all of these species, and left the Maps as a message for their descendants. Are we agreed? But they did not find the puppeteer world."

"Oh?"

"And we know they landed on Jinx. We found a bandersnatch skeleton during the first expedition."

"So we did. They may have visited all these worlds."

The quality of the light changed, and Louis saw the shadow of night receding to antispinward. He said, "Nearly time to land."

"Where do you suggest?"

The sunflower field ahead was brightening with sunlight. "Turn us left. Follow the terminator line. Keep going till you see real dirt. We want to be down before dawn."

Chmeee bent their path in a great curve. Louis pointed. "Do you see where the border dips toward us, where the sunflowers are spreading around both sides of a sea? I think the sunflowers must have trouble crossing water. Land us on the far shore."

The lander dipped into atmosphere. Flame built up before and around the lander, throwing a white glaze over the view. Chmeee held the lander high, shedding their velocity slowly, dipping lower when he could. The sea fled beneath them. Like all Ringworld seas, it was built for convenience, with a highly convoluted shoreline, forming bays and beaches, and a gentle offshore slope to a uniform depth. There were seaweed forests, and numerous islands, and beaches of clean white sand. A vast grassy plain ran to antispinward.

The sunflower plague reached two arms around to engulf the sea. A river meandered through the sunflowers in S-curves to the delta where it entered the sea. To port the sunflowers were edging up against a swampy outflow river. Louis could sense the frozen motion, slow as the march of glaciers.

The sunflowers noticed the lander.

Light exploded from below. The window darkened instantly, leaving Chmeee and Louis dazzled.

"Fear not," Chmeee said. "We can't hit anything at this height."

"The stupid plants probably took us for a bird. Can you see yet?"

"I can see the instruments."

"Drop us to five miles. Put them behind us."

The window cleared a few minutes later. Behind them the horizon blazed; the sunflowers were still trying. Ahead... Yah. "Village."

Chmeee dropped for a closer look. The village was a closed double ring of huts. "Land in the center!"

"I wouldn't. Land at the edge, and I wish I knew what they consider crops."

"I won't burn anything."

A mile above the village, Chmeee braked the lander with the fusion drive. He settled on the tall grassy stuff that covered the plain. At the last moment Louis saw the grass move—saw three things like green dwarf elephants stand up, raise short, flattened trunks to bleat warning, and begin running.

"The natives must be herders," Louis said. "We've started a stampede." More green beasts were joining the exodus.

Larry Niven

"Well... good flight, captain."

The instruments showed Earthlike atmosphere. Hardly surprising. Louis and Chmeee donned impact armor: leather stuff, not unpleasantly stiff, which would go rigid as steel under impact from spear, arrow, or bullet. They added sonic stunner, translators, binocular goggles. The ramp carried them down into waist-high grass.

The huts were close together and joined by fences. The sun was right overhead—of course. It was dawn, and the natives ought to be just stirring. No windows on the outsides of the huts, except for one twice the height of the others, and that had a balcony. Perhaps they'd been seen already.

As Chmeee and Louis came near, the natives stirred.

They came over the fence in a bounding swarm, screaming at each other in falsetto. They were small and red and human-shaped, and they ran like demons. They carried sticks and spears. Louis saw Chmeee draw his stunner, and drew his own. The red humanoids darted past Louis and Chmeee and kept going.

Chmeee asked, "Have we been insulted?"

"No, they're off to turn the stampede, of course. I can't even fault their sense of proportion. Let's go in. Maybe somebody's home."

Somebody was. A couple of dozen redskinned children watched them from behind the fences as they approached. They were thin; even the babies were lean as greyhound puppies. Louis stopped at the fence and smiled at them. They paid him scant attention. Most of them clustered around Chmeee.

The compound within the circle of huts was bare earth. A border of rocks marked a burnt-out campfire. A one-legged red man came out of one building and approached, using a crutch, moving at a pace Louis would have considered jogging. He wore a kilt of cured hide marked with decorative lacing. His ears were large and stood out from his head, and one had been torn, long ago. His teeth were filed—were they? The children were all smiling and laughing, and their teeth were filed, even in the babies. Nope. They must grow that way.

The old man stopped at the fence. He smiled and asked a question.

"I don't speak your language yet," Louis said.

The old man nodded. He gestured with an upward sweep of his arm: invitation?

One of the older children found the courage to leap. He (she; the children wore no kilts) landed on Chmeee's shoulder, settled herself comfortably in the fur and began to explore. Chmeee stood very still. He asked, "What should I do now?"

"She isn't armed. Don't tell her how dangerous you are." Louis climbed over the fence. The old man stood back for him. Chmeee followed, carefully, with the girl still on his shoulder, clinging to the thick fur around his neck.

They settled near the fireplace, Louis and Chmeee and the one-legged red man, surrounded by children. They began to teach the native language to the translating widgets. For Louis it was routine. Oddly, it also seemed routine to the old man; even the voices of the translators didn't surprise him.

His name was Shivith hooki-Furlaree something. His voice was high and piping. His first intelligible question was, "What do you eat? You don't have to say."

"I eat plants and sea life and meat treated with fire. Chmeee eats meat without fire," Louis said, and that seemed sufficient.

"We eat meat without fire, too. Chmeee, you are an unusual visitor." Shivith hesitated. "I have to tell you this. We do not do rishathra. Don't be angry." At the word rishathra the translator only beeped.

Chmeee asked, "What is rishathra?"

The old man was surprised. "We thought that the word was the same everywhere." He began to explain. Chmeee was oddly silent as they delved into the subject, working around the unknown words:

*Rishathra* was sex outside of one's species.

Everyone knew the word. Many species practiced it. For some it could be a means of mutual birth control. For others, the first move in a trade agreement. For some it was taboo. The People didn't need a taboo. They just couldn't do it. The sexual signals were wrong; it might be a matter of distinct pheromones. "You must come from far away, not to know this," the old man said.

Louis spoke of himself, how he had come from the stars beyond the Arch. No, neither he nor Chmeee had ever practiced *rishathra*, though there was great variety among his species. (He remembered a Wunderland girl a foot taller and fifteen pounds lighter than himself, a feather in his arms.) He spoke of the variety of worlds and of intelligent life; but he skirted the subject of wars and weaponry.

The tribes of the People herded many kinds of animals. They liked variety, but they didn't like starving, and it was not usually possible to keep herds of different animals at the same time. Tribes of the People kept track of each other, to trade feasts. Sometimes they traded herds. It was like trading entire lifestyles: you could spend half a *falan* in mutual instruction before parting. (A *falan* was ten turns, Ringworld rotations: seventy-five days of thirty hours each.)

Would the herders worry that there were strangers in the village? Shivith said they wouldn't. Two strangers were no threat.

When would they return? At midday, Shivith said. They had had to hurry; there had been a stampede. Otherwise they would have stopped to talk.

Louis asked, "Do you need to eat meat right after it's been killed?"

Shivith smiled. "No. Half a day is okay. A day and a night is too long."

"Do you ever—"

Chmeee stood up suddenly. He set the girl down gently and turned off his translator. "Louis, I need exercise and solitude. This time of confinement has threatened my sanity! Do you need me?"

"No. Hey—"

Chmeee was already over the fence. He turned.

"Don't take off your clothes. At a distance there's no way to tell you're intelligent. Don't kill any of the green elephants."

Chmeee waved and bounded off into the green grass.

"Your friend is fast," said Shivith.

"I should go, too. I have a project in mind."

Survival and escape had been their concerns during their first visit to the Ringworld. Only later, in the safe and familiar surroundings of Resht on Earth, had Louis Wu's conscience become active. Then he remembered destroying a city.

The shadow squares formed a ring concentric to the Ringworld. There were twenty of them held face-on to the sun by invisibly thin wire. The wire stayed taut because the shadow squares rotated at greater than orbital speed.

*Liar*, falling free with its drive motors burned away, had struck one of the shadow square wires and torn it loose. The wire, a single strand tens of thousands of miles long, had settled like a smoke cloud over an occupied city.

Louis had needed it to tow the grounded *Liar*.

They had found an endpoint and moored it to their makeshift vehicle—Halopriphillar's floating jail—and towed it behind them. Louis couldn't know exactly what had happened to the city, but he could guess. The stuff was fine as gossamer and strong enough to cut hullmetal. It must have cut the buildings into gravel as its loops contracted.

This time the natives would not suffer because Louis Wu had arrived. He was in current addiction withdrawal; he didn't need guilt, too. His first act on this visit was to start a stampede. He was going to fix that.

It was hard physical work.

He took a break at one point and went up on the flight deck. He was worried about the *zkin*. Even a human being—a flatlander of five hundred years ago, say, a successful man in middle age—might have been disconcerted to find himself suddenly eighteen years old, his smooth progression toward death interrupted, his blood flowing with powerful and unfamiliar juices, his very identity in question—hair thickening and changing color, scars disappearing—

Well, where was Chmeee?

The grass was strange. Here in the vicinity of the camp, it was waist high. To spinward was a vast area cropped almost to the ground. Louis could see the herd moving along the edge, guided by small red humanoids, leaving a swath that was almost dirt-colored.

Give 'em this: the little green elephants were efficient. The red men must have to shift camp fairly frequently.

Louis saw motion in the grass nearby. He watched, patiently, until it moved again—and suddenly it was an orange streak. Louis never saw Chmeee's prey. There were no humanoids around, and that was good enough. He went back to work.

The herdsmen returned to find a feast.

They came in a band, chattering among themselves. They paused to examine thelander without coming too close. Some of them surrounded one of the green elephants. (Lunch?) It may have been coincidence that the spearmen led the rest as they entered the circle of huts.

They stopped in surprise, confronting Louis, and Chmeee—with a different girl on his shoulder—and half a ton of dressed meat laid on clean leather.

Shivith introduced the aliens, with a short and fairly accurate account of their claims. Louis was prepared to be called a liar—but it never happened. He met the Chief: a woman four feet and a few inches tall, Ginjerofer by name, who bowed and smiled with disconcertingly sharp teeth. Louis tried to bow in the same fashion.

"Shivith told us you like variety in meat," Louis said, and gestured toward what he had taken from the lander's kitchen. Three of the natives turned the green elephant around, aimed it at where the rest of the herd was grazing and prodded its butt with spear shafts to get it going. The tribe converged on lunch. Others came to join them, out of huts Louis had assumed were empty: a dozen very old men and women. Louis had thought Shivith was old. He was not used to seeing people with wrinkled skin and arthritic joints and old scars. He wondered why they had hidden, and surmised that arrows had been aimed at him and Chmeee while they talked with Shivith and the children.

In a few minutes the natives reduced the meal to bones. They did no talking; they seemed to have no order of precedence. They ate, in fact, like *zkin*. Chmeee accepted a gestured offer to join them. He ate most of the moa, which the native ignored; they preferred red meat.

Louis had carried it in several loads on one of the big repulsion plates. His muscles ached from the strain of moving it. He watched the natives tearing into the feast. He felt good. There was no droud in his head, but he felt good.

Most of the natives left then, to tend the herd. Shivith and Ginjerofer and some of the older ones stayed. Chmeee asked Louis, "Is this moa an artifact or a bird? The Patriarch might want such birds for his hunting parks."

"There's a real bird," Louis said. "Ginjerofer, this should make us even for the stampede."

"We thank you," she said. There was blood on her lips and chin. Her lips were full, and redder than her skin. "Forget the

THE RINGWORLD ENGINEERS

stampede. Life is more than not being hungry. We love to meet people who are different. Are your worlds really so much smaller than ours? And round?"

"Round like balls. If mine were far up the Arch, you would see only a white point."

"Will you go back to these small places to tell of us?"

The translators must be feeding to recorders aboard *Needle*. Louis said, "One day."

"You will have questions."

"Yah. Do the sunflowers ruin your grazing ground?"

He had to point before she understood. "The brightness to spinward? We know nothing of it."

"Did you ever wonder? Ever send scouts?"

She frowned. "This is the way of it. My fathers and mothers tell that we have been moving to antispinward since they were little. They remember that they had to go around a great sea, but they did not come too close, because the beasts would not eat the plants that grow around the shore. There was a brightness to spinward then, but it is stronger now. As for scouts... a party of the young went to see for themselves. They met giants. The giants killed their beasts. They had to return quickly then. They had no meat."

"It sounds like the sunflowers are moving faster than you are."

"Okay. We can move faster than we do."

"What do you know about the floating city?"

Ginjeroffer had seen it all her life. It was a landmark, like the Arch itself. Sometimes when the night was cloud-covered you could still find the yellow glow of the city, but that was all she knew. The city was too far even for rumor.

"But we hear tales from large distances, if they are worth telling. They may be garbled. We hear of the people of the spill mountains, who live between the cold white level and the foothills where air is too dense. They fly between the spill mountains. They use sky sleds when they can get them, but there are no new sky sleds, so that for hundreds of years they must use balloons. Will your seeing-things see that far?"

Louis put the binocular goggles on her and showed her the enlargement dial. "Why did you call them *spill mountains*? Is that the same word you use when you spill water?"

"Yes. I don't know why we call them that. Your eyepiece only shows me larger mountains..." She turned to spinward. The goggles almost covered her small face. "I can see the shore, and a glare across."

"What else do you hear from travelers?"

"When we meet we talk most of dangers. There are brainless meat-eaters to antispinward that kill people. They look something like us, but smaller, and they are black and hunt at night. And there are..." She frowned. "We don't know the truth of this. There are mindless things that urge one to do *rishathra* with them. One does not live through the act."

"But you can't do *rishathra*. They can't be dangerous to you."

"Even to us, we are told."

"What about diseases? Parasites?"

None of the natives knew what he meant! Fleas, hookworm, mosquitos, measles, gangrene: there was nothing like that on the Ringworld. Of course he should have guessed that. The Ringworld engineers just hadn't brought them. He was startled nonetheless. He wondered if he might have brought disease to the Ringworld for the first time, and decided that he had not. The autodoc would have cured him of anything dangerous.

But the natives were that much like civilized humans. They grew old, but not sick.

## THE GOD GAMBIT



OOURS BEFORE NIGHTFALL, Louis was exhausted.

Ginjeroffer offered them the use of a hut, but Chmee and Louis elected to sleep in the lander. Louis fell between the sleeping plates while Chmee was still setting up defenses.

He woke in the dead of night.

Chmee had activated the image amplifier before he went to sleep. The landscape glowed bright as a rainy day. The daylight rectangles of the Arch were like ceiling light panels: too bright to do more than glance at. But most of the nearer Great Ocean was in shadow.

The Great Oceans lured him. They were flamboyant. They should not have been. If Louis was right about the Ringworld Engineers, flamboyance was not their style. They built with simplicity and efficiency, and they planned in very long timespans, and they fought wars.

But the Ringworld was flamboyant in its own way, and impossible to defend. Why hadn't they built a lot of little Ringworlds instead? And why the Great Oceans? They didn't fit, either.

He could be wrong from the start. That had happened before! Yet the evidence—

Was there something moving in the grass?

Louis activated the infrared scanner.

They glowed by their own heat. They were bigger than dogs, like a blend of human and jackal: horrid supernatural things in this unnatural light. Louis spent a moment locating the sonic stun cannon in the lander's turret and another swinging it toward the interlopers. Four of them, moving on all fours through the grass.

They stopped not far from the huts. They were there for some minutes. Then they moved off, and now that were hunched half-erect. Louis turned off the infrared scanner.

In augmented Archlight it was clear: they were carrying the day's garbage, the remains of the feast. Ghouls. The meat probably wasn't ripe enough for them yet.

Yellow eyes in his peripheral vision: Chmee was wide awake. Louis said, "The Ringworld's old. A hundred thousand years at least."

"What makes you say that?"

"The Ringworld engineers wouldn't have brought jackals. There's been time enough for some branch of the hominids to fit that niche in the ecology."

"A hundred thousand years wouldn't be enough," said Chmee.

"It might. I wonder what else the engineers didn't bring. They didn't bring mosquitoes."

"You are facetious. But they would not have brought bloodsuckers of any kind."

"No. Or sharks, or cougars." Louis laughed. "Or skunks. What else? Snakes? Mammals couldn't live like snakes. I don't think any mammals secrete poison in their mouths."

"Louis, it would take millions of years for hominids to evolve in so many directions. We must consider whether they evolved on the Ringworld at all!"

"They did, unless I'm completely wrong. As for how long it took, there's a small matter of mathematics. If we assume they started evolving a hundred thousand years ago, from a base popu..." Louis let it trail off.

A good distance away and moving at fair speed considering their burdens, the jackal-hominids suddenly stopped, turned back, seemed to pose for a moment, then dropped into the grass and vanished. A touch of the infrared sensor showed four glowing spots fanning out and away.

"Company to spinward," Chmee said quietly.

The newcomers were big. They were Chmee's size, and they weren't trying to hide. Forty bearded giants marched through the night as if they owned it. They were armed and armored.

[To Be Continued]

# The Aleph

Andrew A.  
Whyte

For the sake of brevity and convenience, certain abbreviations have been supplied as a reference code. They will be found on the right-hand side. Here is a key: (C) Collection (more than one story by the same author); (C+) Story series collected or collection with unifying theme; (F) Fantasy; (J) Juvenile; (O) Omnibus (Collection containing at least one novel). Since SF novels make up the majority of books listed, none of these are specified as such. We have recently added new symbols to deal with the increasing amount of illustrated fiction. (GN) Graphic Novel; (GS) Graphic Story; and (GC) Graphic Collection—are used to denote books of which approximately equivalent portions are shared between text and artwork.



ADAMS, Robert  
*Castaways In Time*  
Illustrations by Kelly Freas  
Starblaze/May/\$4.95

AKERS, Alan Burt  
see PRESCOT

ALEXANDER, Karl  
*Time After Time*  
Delacorte/March/\$9.95

ANDERSON, Margaret J.  
*In the Circle of Time*  
Knopf/April/\$6.95  
for ages from 10 to 14

ANTHONY, Piers  
God of Tarot  
[sequel to Cluster series]  
Jove/April/\$1.75  
(1st in a new trilogy)

ANTHONY, Piers  
and HALL, Frances  
*Pretender*  
Borgo Press/May/\$4.95

ASIMOV, Isaac  
*In Memory Yet Green: The Autobiography of Isaac Asimov 1920-1954*  
Doubleday/March/\$15.95  
SF Book Club alternate/June/\$7.98

Opus 200 (C)  
Houghton, Mifflin/March/\$10.95



ASPRIN, Robert  
*The Bug Wars*  
St. Martin's Press/March/\$8.95

BEASLEY, Conger (F)  
Hidalgo's Beard: A California Fantasy  
Andrews & McMeel/April/\$9.95 & \$5.95  
BESTER, Alfred (GN)  
*The Stars My Destination: Volume One*  
Text adapted by Byron Preiss  
Illustrated by Howard Chaykin  
Baronet/April/\$15.95 & \$8.95

BETHANCOURT, T. Ernesto (J)  
*Instruments of Darkness*  
[sequel to THE MORTAL INSTRUMENTS]  
Holiday House/April/\$7.95  
For ages 12 and up.

BISCHOFF, David F.,  
and BAILEY, Dennis R.  
Tim Woodley  
Doubleday/April/\$7.95

BLOOM, Harold (F)  
*The Flight to Lucifer: A Gnostic Fantasy*  
Farrar, Straus & Giroux/May/\$8.95

BOYLE, T. Coraghessan (C)  
*Descent of Man*  
Little, Brown (Atlantic Monthly Press)/  
March/\$9.95



(J)

BRADLEY, Marion Zimmer  
Endless Universe  
Ace/April/\$1.95  
Revised edition of Endless Voyage,  
expanded by 30,000 words.

The Bloody Sun  
Ace/May/\$1.95  
Revised edition, expanded.



CARD, Orson Scott  
*HOT SLEEP*  
[The Worthing Chronicle: Volume Two]  
Baronet/April/\$5.95  
Analog Books (Acc)/May/\$1.95

CARLISLE, Clancy  
Spore 7  
Morrow/March/\$9.95

CARLSON, Cale & Danny  
The Shining Pool  
Argo Books (dist. by Atheneum)  
March/\$6.95

CARR, Jayne  
Leviathan's Deep  
Doubleday/April/\$8.95  
SF Book Club/July/\$2.49+

CHANDLER, A. Bertram  
Into the Alternate Universe  
[reissue/Novel]

&  
Contraband From Otherspace  
[reissue/Novel]  
[The Saga of Commodore John  
Grimes: Book IV]  
Ace/April/\$2.25

CHAYKIN, Howard  
Cody Starbuck  
Star Reach Productions/\$2.00



CHERRYH, C.J.  
*The Faded Sun: Shon'Jir*  
[2nd in a trilogy]  
DAW/April/\$1.95  
Previous SF Book Club publication.

CHURCHILL, David  
It, Us and the Others  
Harper & Row/April/\$7.95

COX, Joan  
Mindsight  
Avon/April/\$2.25

CROWLEY, John  
Engle Summer  
Doubleday/March/\$7.95

DALEY, Brian  
Han Solo At Star's End: From The Adventures of Luke Skywalker, Based on the Characters and Situations Created by George Lucas  
delRey/April/\$8.95  
SF Book Club/August/\$2.49+

DATESH, John Nicholas  
*The Nightmare Machine*  
Belmont Tower/May/\$1.75

DAVIDSON, Avram  
The Kar-Chee-Reign  
&  
Rogue Dragon  
[sequel to above]  
Ace/March/\$1.95  
1st time together in 1 volume.

de CAMP, L. Sprague (verse)  
Heroes and Hooholins  
Illustrations by Tim Kirk  
Heritage Press (distributed by Atheneum)/April/\$15.00  
Postponed from 1978.

DeWEESE, Gene (J)  
Major Corby and the Unidentified Flapping Object  
Doubleday Signal/March/\$5.95  
For ages 9 to 14.

DIAMOND, Graham  
Dungeons of Kuhs  
Adventures of the Empire Princess #2  
[3rd in a series]  
Playboy Press/May/\$1.95

DICKS, Terrance  
Doctor Who and the Day of the Daleks  
[Dr. Who series, No. 1]  
Introduction by Harlan Ellison  
Pinnacle/April/\$1.75  
Adapted from the script of the same name by Louis Marks.

Dr. Who and the Genesis of the Daleks  
[Dr. Who series, No. 4]  
Introduction by Harlan Ellison  
Pinnacle/May/\$1.75  
Adapted from a script by Terry Nation.  
Both first published in U.K. by W.H. Allen.

DOXEY, William S.  
ESPionage  
Belmont Tower/April/\$1.95

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Hammer's Slammers  
Ace/April/\$1.95

DVORKIN, David  
The Green God  
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EISENSTEIN, Phyllis (F)  
Sorcerers Son  
Ballantine-delRey/April/\$1.95

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delRey/May/\$8.95  
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*Wander's Journey*  
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GREGORY, John  
*Legacy of the Stars*  
Leisure Books/April/\$1.50



GRIFFIN, Russell M.  
*The Makashif God*  
Dell/April/\$1.95

Drew Whyte

GROSSBACH, Robert  
*Never Say Die: An Autonecrographical Novel*  
Harper & Row/March/\$8.95

HACKETT, General Sir John, and others  
*The Third World War: August 1985*  
Macmillan/February/\$12.95



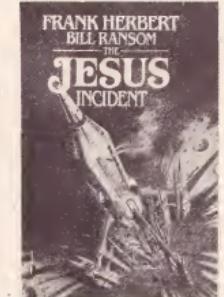
HANDLEY, Max  
*Meanwhile*  
Illustrations by Rowena Morrill  
Warner/May/\$5.95  
1st publication in the UK (1978) by Arlington Books.

HARDY, T.W.  
*Sum VII*  
Harper & Row/April/\$8.95

HARDING, Lee  
*Misplaced Persons*  
Harper & Row/April/\$7.95  
For ages 12 and up.  
First published in Australia (1978) by Cassell.

HARRISON, Harry  
*The Stainless Steel Rat Wants You*  
SF Book Club (Nelson Doubleday)/Spring/\$2.49+

HEARNE, Betsy Gould  
*Home*  
[Sequel to South Star]  
Illustrated by Trina Schart Hyman  
Margaret K. McElroy/March/\$7.95  
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HERBERT, Frank and RANSOM, Bill  
*The Jesus Incident*  
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Sequel to DESTINATION: VOID.

HERBERT, James  
*Lair*  
NAL Signet/May/\$2.25  
Replaces THE SPEAR. First publication in UK.

HOOVER, H.M.  
*The Lost Star*  
Viking/April/\$8.95  
For ages 12 and up.

HOWARD, Robert E.  
*The Hills of the Dead*  
[Solomon Kane series, No. 2]  
Introduction by Ramsey Campbell  
Bantam/March/\$1.95

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Illustrations by Esteban Maroto  
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Zebra/April/\$1.95

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*Time Piper*  
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Introduction by Harlan Ellison  
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IVERSON, Eric  
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(J) LANCOUR, Gene  
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*Dracondruidus*  
[Harpers of Pern series, No. 3]  
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*So Beautiful and So Dangerous*  
Heavy Metal/April/\$6.95

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[Hed Trilogy: Volume III]  
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GALILEO 79

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*The Battletear Galactica Storybook*  
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MONTELEONE, Thomas F.  
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Fawcett Popular Library/May/\$1.75  
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MOORCOCK, Michael  
*Gloriana, Or The Unfulfill'd Queen*  
Illustrated by Elizabeth Malczynski  
Avon/April/\$4.95  
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CAWTHORN, James (art)  
Michael Moorcock's *The Jewel in the Skull*  
[Hawkmoon series, No. 10]  
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*The Carnelian Throne*  
[Silistra series, No. 4]  
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*The Mad Throne*  
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[War of the Gods on Earth: Volume II]  
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*The Sword of Skelos*  
[Bantam Conan series, No. 3]  
Bantam/May/\$1.95

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*The Pleasure Tube*  
Berkeley/March/\$1.75

PAUL, Barbara  
*Pillars of Salt*  
NAL Signet/April/\$1.75

PAULSEN, Gary  
*Meteorite Track 291*  
Dell-Bryants/May/\$2.25

PEEL, Colin D.  
Hell Seed  
St. Martin's Press/May/\$8.95  
First publication in UK (1978) by Robert Hale.

PETAJA, Emili  
*Saga of Lost Earths* (O)  
[Kalevala series]  
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PETYO, Robert  
*The Flight of Endeavor*  
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PIPER, H. Beam  
*Four-Day Planet*  
Reprint/Novel  
&

PIPER, H. Beam  
and McGUIRE, John J.  
*Long Star Planet*  
Reissue/Novel  
formerly published as "A Planet for Texans."  
Ace/April/\$2.25

PISERCHIA, Doris  
*Spacing*  
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POHL, Frederik (C)  
*Jem*  
St. Martin's Press/April/\$10.00  
SF Book Club/September/\$3.50+

PREISS, Byron  
*Guts*  
Illustrations by Gray Morrow  
(J) and Michael Golden  
Ace Star/May/\$1.75

'PRESOT, Dray  
(as told to Alan Burt AKERS)  
*A Life for Kregen*

(F) [Dray Prescot series, No. 19; Jikaida Cycle; Volume I]  
Illustrations by Richard Hescox  
DAW/April/\$1.75

PULLMAN, Philip  
*Galatea*  
Dutton/March/\$8.95  
1st publication in UK (1978)

REAMY, Tom (C)  
*San Diego Lightfoot Sue and Other Stories: A Memorial Volume*  
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RICHMOND, Walt & Leigh Siva!  
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Dial (James Wade)/March/\$7.95  
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ROGERS, Michael (C)  
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RUBIAO, Marilo (C)  
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Translated from the Portuguese by Thomas Colchie  
Harper & Row/February/\$10.00

RUDHYAR, Dane  
*Return From No Return*  
The Seed Center/\$3.00

RUSSELL, P. Craig (GS)  
and MASON, Patrick C.  
*Parasifal*  
Star Reach Productions/\$2.00

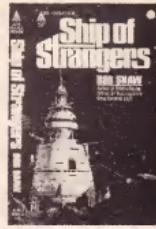


SABERHAGEN, Fred  
*Berzerker Man*  
Ace/April/\$1.95  
Chronologically the final volume in the Berzerker Saga. Afterward by Sandra Miesel. Bibliography.

SAVCHENKO, Vladimir  
*Self-Discovery*  
[Soviet Science Fiction Series: VIII]

Translated from the Russian by Antonina W. Bouis  
Introduction by Theodore Sturgeon  
Macmillan/April/\$9.95

SCHMITZ, James H.  
Legacy  
Ace/May/\$1.95  
First publication (1962) as "A Tale of Two Clocks."



SHAW, Bob  
*Ship of Strangers*  
Ace/April/\$1.75  
First publication in UK (1978) by Gollancz.

SILVERBERG, Robert (C)  
*Capricorn Games*  
Illustrations by Kelly Freas  
Starblaze/April/\$4.95  
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SLEATOR, William (J)  
*Into the Dream*  
Illustrations by Ruth Sanderson  
Dutton/March/\$7.50  
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SMITH, Cordwainer (C+)  
*The Instrumentality of Mankind*  
Introduction by Frederik Pohl  
Ballantine-delRey/May/\$1.95



SMITH, E.E.  
*The Best of E.E. "Doc" Smith*  
Preface by Philip Harbottle  
Introduction by Walter Gillings  
Jove/March/\$1.75  
With afterword by the author and bibliography. First publication in UK (1975) by Futura (Orbit Books).

SMITH, E.E. "Doc"  
with EKLUND, Gordon  
*Space Pirates*  
[Lord Eddrie series, No. 2]  
Baronet/April/\$4.95

SMITH, Edward E. "Doc"  
(EVANS, E. Everett)  
(HAMM, Thelma D.)  
*Masters of Space*  
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Brian Aldiss, Ray Bradbury, Lee Kilkough, Carl Sagan

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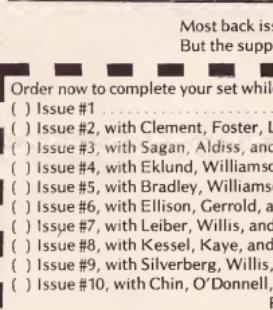
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Introduction by Theodore Sturgeon  
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STURGEON, Theodore  
More Than Human (The Graphic Story Version)  
Text adapted by Goug Moench  
Illustrations by Alex Nino  
Produced by Byron Preiss  
Heavy Metal Books (distributed by Simon & Schuster)/March/\$8.95

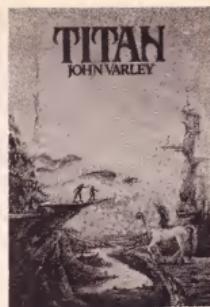
SUSANN, Jacqueline  
Yargo  
Bantam/March/\$2.50

SWIGART, Rob  
The Time Trip  
Houghton, Mifflin/April/\$8.95 & \$4.95

TARAS, Katherine  
(F)  
A Dream of Vikings That Were  
ManorTime/Past Editions/(\$May/1.95

TURNER, George  
Beloved Son  
Pocket Books/April/\$2.25  
First publication in UK (1978) by Faber & Faber.

Van VOGT, A.E.  
Renaissance  
Pocket Books/May/1.95  
Title in manuscript: "Indian Summer of a Pair of Spectacles."



VARLEY, John  
Titan  
Berkley-Putnam/March/\$9.95  
SF Book Club/July/\$2.49 +  
Illustrations by Freff  
Serialized in Analog January-April, 1979.

VERNAM, Glenn A.  
The Power of the Gods  
Manor/April/1.95

VERNE, Jules  
(O)  
The Best of Jules Verne  
Castle Books (distributed in US by Book Sales, Inc./March/4.98  
Translated from the French. With the original engravings. Contains AROUND THE WORLD IN EIGHTY DAYS, THE CLIPPER OF THE CLOUDS, JOURNEY TO THE CENTER OF THE EARTH.

WALKER, Hugh  
Messengers of Darkness  
[Magira series: III]  
Translated from the German by Christine Priest  
DAW/March/\$1.50

WALLACE, Irving  
The Pigeon Project  
Simon & Schuster/April/\$10.95

WALTERS, Hugh  
The Caves of Drach (J)  
[Chris Godfrey series]  
Faber & Faber/March/\$6.95  
For ages 8 to 11. First publication in UK (1978).

WARREN, George  
Dominant Species  
Illustrations by Kelly Freas  
Starblaze/March/\$4.95  
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WATSON, Ian  
The Very Slow Time Machine  
Ace/April/\$1.75  
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WATSON, Patrick  
Alter Ego  
Viking/March/\$9.95  
Harper & Row/May/\$12.50  
SF Book Club (alternate selection)/October/\$3.50

WEST, Carl  
and MacLEAN, Katherine  
Dark Wing  
Argo Books/March/\$8.95

WEVERKA, Robert (adaptor)  
Circle of Iron  
Warner/February/\$1.95  
Based on a screenplay by Stirling Silliphant and Stanley Mann based on an idea by Silliphant and James Coburn and Bruce Lee.

WHEATLEY, Dennis  
They Found Atlantis  
Hutchinson/February/\$9.95  
First published in US (1936) by Lippincott.

WILLIAMS, Gordon  
The Microcolony  
Bantam/May/\$1.95  
Sequel to THE MICRONAUTS

WOLD, Allen  
The Planet Masters  
St. Martin's Press/May/\$8.95

WOOD, Wallace  
(F/GS)  
The Wizard King  
Wallace Wood (Box 3733 Amity Station /New Haven CT 06525)/\$10.00

WRIGHTSON, Marge  
The Dark Bright Water  
Margaret K. McElroy/March/\$7.95  
For ages 12 and up. First publication in UK (1978).

ZBROWSKI, George  
Macrolife  
Illustrations by Rick Sternbach  
Harper & Row/May/\$12.50

ZELAZNY, Roger  
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ASIMOV, Isaac  
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Isaac Asimov Presents The Great SF Stories: Volume 1 (1939)  
DAW/March/\$2.25

BAEN, James [editor]  
Destinies: Volume 1, No. 3  
Ace/April/\$2.25



BEST, Carl  
and GREENBERG, Martin H. [editors]  
Destinies: Volume 1, No. 3  
Ace/April/\$2.25

CARR, Terry [editor]  
Universe Nine  
Doubleday/May/\$7.95

HOSKINS, Robert [editor]  
Against Tomorrow  
Fawcett Gold Medal/April/\$1.75

PAGE, Gerald W.  
and REINHARDT, Hank [editors]  
Heroic Fantasy  
DAW/April/\$1.95

POURNELLE, Jerry [editor]  
Black Hole  
Fawcett Crest/May/\$1.95

PRONZINI, Bill [editor]  
Werewolf! A Crestomathy of Lycanthropy  
Arbor House/March/\$8.95

SILVERBERG, Robert [editor]  
New Dimensions 9  
Harper & Row/April/\$10.95

The Edge of Space: Three Original Novellas of Science Fiction  
Elsevier-Nelson/May/\$7.95

SILVERBERG, Robert  
and GREENBERG, Martin H.  
and OLANDER, Joseph D. [editors]  
Dawn of Time: Prehistory Through Science Fiction  
Elsevier-Nelson/May/\$7.95

WESTON, Peter [editor]  
Andromeda (I)  
St. Martin's Press/April/\$8.95  
1st publication in UK (1976) by Orbit (Future) Publications, Ltd.

WOLHEIM, Donald A. [editor]  
The 1979 Annual World's Best SF  
DAW/May/\$2.25

—G—

The Aleph

Winner Vonda McIntyre

## Nebula Awards

Every year, the Science Fiction Writers of America confer five awards on science fiction writers for achievements in various categories. One of the two best known awards in the field, the Nebula is widely considered the most prestigious. It carries with it the recognition of a writer's work by his peers.

This year's winners are:

**Best Novel:** *Dreamsnake* by Vonda N. McIntyre (Houghton Mifflin); **Best Novel:** "The Persistence of Vision" by John Varley (*F&SF*, March 1978); **Best Novelette:** "A Glow of Candles, A Unicorn's Eye" by Charles L. Grant from *Graven Images* (Thomas Nelson); **Best Short Story:** "Stone" by Edward Bryant (*F & SF*, February 1978). **Grand Master Award:** to L. Sprague de Camp.

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# Reviews

Floyd Kemske



BORN TO EXILE  
by Phyllis Eisenstein  
Arkham House, \$8.95

Reviewed by George R.R. Martin

**B**ORN TO EXILE is the first published book from Phyllis Eisenstein, a young and vastly underrated writer who has been publishing short fiction regularly since 1971, but who has not attracted anywhere near the amount of attention her work deserves. Beyond that it is a hell of a difficult book to categorize.

The story chronicles the travels of Alaric, a sixteen-year-old wandering minstrel gifted with the power of teleportation, a power that is not entirely a blessing in the superstitious, witch-fearing lands through which he rides.

Despite the superficial appearances, I would not call *Born to Exile* a sword-and-sorcery novel. Except for Alaric's own power, the sorcery in Eisenstein's tale is all superstition and fakery, and while Alaric does carry a sword, he seldom uses it. Most

important, the feel is entirely different. Alaric is as different from Conan—or even Fafhrd and the Mouser—as a character can get, and his world is a thousand times more real than most of the gimcrack-and cardboard kingdoms of routine sword-and sorcery.

It is tempting to talk about *Born to Exile* almost as a sort of historical fiction, except that it fits no history I know of. The lands in which Alaric sings for supper and performs his vanishing trick and has his adventures are definitely medieval, but they are not the kingdoms and baronies of our Middle Ages.

So where does this leave me? Probably with science fiction. Alaric's power—teleportation—is after all a time-honored SF device, and like other psi powers is generally not considered sufficient in itself to make a work fantasy rather than SF. His world, which is neither alien nor fantastic nor historical, can probably best be seen as an alternate medieval Earth. So, castles and knights be damned, what we have here is a science fiction novel...

...well, maybe not entirely a novel. Alaric's adventures have graced the pages of *F&SF* since 1971, and *Born to Exile* weaves together four tales originally published independently. Eisenstein is a more skillful weaver than most; if I had not already read these stories in their magazine appearances, I might not have noticed the seams. The continuity from story to story is quite strong, and the end of the book is just that: the end of the *book*, not merely of the fourth story. So perhaps this is a novel after all.

The author's growth is dramatically visible in *Born to Exile*, which improves as it goes along. The title segment which opens the book was written and published first, and it is the least satisfying chunk of the narrative. Castle Royale, its setting, is too much like all the other castles in fiction; the princess Alaric falls in love with is a bit too princessy; and the world and characters are all a bit too vague, though the plot moves along crisply enough.

The second segment, "Inn of the Black Swan," is more recent, and better. Here the situation into which Alaric stumbles is less familiar and more intriguing, and here the characters are considerably more complex.

Then comes "The Witch and the Well," which is better still, and which finally makes it clear that this book is not to be simply a string of episodic

adventures, but rather a unified narrative.

Finally, come "The Lords of All Power" and "The Castle Under the Hill"—which were written and published as one, though Arkham House has divided them into two chapters in its edition—and in these closing sections, wherein Alaric returns to his family and his heritage and solves the mysteries of his birth, Eisenstein really hits her stride. The three-tiered wedding-cake castle of Baron Garlenon alone testifies to how far the author has come in a few years. It is so real, so individual, and described with such richness of detail, that it makes the earlier Castle Royale a pale shadow in comparison. The closing sections are rich in other ways as well; here are places and people who will linger in memory, the end of relationships and the beginning of others, tragedies and trials and triumphs.

(Postscript: I might also add that the Arkham House edition of *Born to Exile* is worth getting, even for those who customarily wait for the paperback. It is an unusually handsome book, thanks to a number of interior illustrations by Steve Fabian which rank with his very best work. If your bookstore does not stock Arkham titles, ask them to order it for you. It is well worth the price.)



ESCHATUS  
by Bruce Pennington  
Simon and Schuster, \$19.95 (hb), \$8.95 (sb)

Reviewed by Sandra Miesel

**T**O BEGIN with, *eschatos* (Greek *eschatos*) means "furthest" and the theological term for the End of the World is *eschaton*. Thus *Eschatus* is an appropriate as well as an exotic-sounding title for Bruce Pennington's interpretations of Nostradamus' prophecies.

Reviews

Turning the cryptic messages into "an illustrated epic of the future" is a welcome innovation, far preferable to the usual gnat-straining historical exegeses of Nostradamus. Pennington wisely places the French prophet's work within the larger context of apocalyptic literature. This opens up a store of familiar Biblical images: troublings in earth and sea and sky, falling empires, world tyrants, false prophets, and a universal Messiah. The most beautiful painting in *Eschatus* depicts the Woman Clothed in the Sun from the Book of Revelation.

Pennington has rearranged individual quatrains from the *Centuries* of Nostradamus to form a continuous scenario of events between 2100 and 2300 when wars and cataclysms yield to the Golden Millennium of peace. The prophecies are rendered in 40 illustrations, including 16 double-page spreads plus a frontispiece. (The strikingly grotesque image of Death on the back of the dust jacket is inexplicably missing from the book itself.) The illustrations are followed by 1290 lines of Pennington's own versions of the prophecies arranged in triple columns without line numbers or any cross-references to the preceding pictures. These columns are presumably meant to be read vertically but make as much sense horizontally. One might even try them diagonally with equal success. The effect is rather like computer-written poetry—portentous phrases and occasional vivid fragments that signify nothing much in particular.

The printing (done in Holland) is excellent but the binding seems weak. Signatures are already starting to tear away from the stitching in my copy despite gentle handling—the hardbound edition may not be worth the extra \$11.00 over the price of the softbound. The layout of *Eschatus* is good, a rhythmic variation of image size and position. The fashionable solid black borders heighten the brilliance of the colors but also make the French text, reproduced from poorly printed Renaissance originals, hard to read. Word by word comparison with the translation is futile in any case because of typographical errors and orthographic inconsistencies in the original wording. The reader had best be content with the editors' constructions. (They do offer footnotes.)

Pennington has deliberately restricted his palette in the interest of unity. He coordinates the colors of illustrations on facing pages and repeats the same hues

of turquoise, crimson, and gold throughout. True green is virtually absent for obvious symbolic reasons. Unfortunately, the effect is monotonous. More pictures in the muted shades would have been welcome. Greater subtlety in color harmonies and a sense of luminosity would have improved the package. I do not care for his choice of an opaque medium—the results tend to be too flat and obvious (as in the pictured neoclassical city).

Color monotony is matched by static, symmetrical compositions (the tableaux of tyranny are especially poor) and repetitive motifs (shattered cities, columns of smoke, maps; Fascist, imperial, and papal references). Some otherwise pleasing images are spoiled by jarring elements (the peacock on the floating platform, and the flying saucer—the artist has a dreadful way with a flying saucer).

At least Pennington is to be commended for attempting fantasy illustration in an Art Deco mode instead of the now-conventional Art Nouveau. In general, his sketchier images work better than his defined ones (one exception is his portrait of an evil Pope—a veritable Caligula in a cast-sock). The final pair of paintings, the charnel city contrasted with the glowing savior, work well both individually and together. If only the rest of the ensemble had been as fine! There are enough good pictures here to have filled a stunning calendar. Penningtons would seem better savored one by one. For me, examining *Eschatus* was like trying to quaff a whole goblet of anisette. But tastes differ. You must decide for yourself whether you care for the flavor of licorice—or Bruce Pennington.

#### PURSUIT OF THE SCREAMER

by Ansen Dibell  
DAW, \$1.95

*Reviewed by David A. Truesdale*

**D**ONALD A. WOLHEIM has long been known for publishing the first works of now-famous authors—Samuel R. Delany, Marion Zimmer Bradley, and Ursula LeGuin just to name three. More recently he has introduced us to C.J. Cherryh, Jo Clayton, and, with this first novel, one Ansen Dibell.

*Pursuit of the Screamer* is very much in the same vein as Cherryh, Clayton, or even Marion Zimmer Bradley in that this is a long, detailed, adventure

fantasy much wedded to science fiction in its basic concepts and premises, but with the flavor and atmosphere of the pure fantasy novel. This time-honored blending is highly appealing if rendered with skill and imagination and is why, I suspect, the works of the above-mentioned are all so deservedly appreciated.

Dibell's nameless world was invaded three thousand years before this story

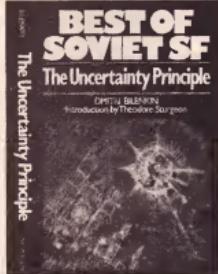


takes place by a super-scientific space-faring race now known by the names of its two dying remnants, the Tekks (technocrats) and Meks (mechanists/tool-makers), who made slaves and pets of the native Valde. Through a breakdown in the governing process, the immortal Tekks lost control over themselves and their slaves, who revolted and left the High Plain of their rulers for the lower river country. Over the millennia, as the Valde have befriended the Beremni and the Innsmith folk, the Tekks have become bored with their immortality and have unsuccessfully attempted to rescind it, for isolated as they are by a force shield known as the Wall, their food and new body supply has been gradually depleted to such a pitiful state as to reduce the few hundred remaining Tekks to savagery and cannibalism.

Our story begins when one of these remaining few, named Lur, has escaped the confines of the Wall and seeks to lead a small expedition back onto the High Plain to destroy once and for all the central power dome which has made it impossible for him and the last few Tekks to finally die a permanent and merciful death, no more to awaken in a fresh body to struggle yet another lifetime in squalor and barbarism.

With Marion Zimmer Bradley and C.J. Cherryh one can usually count on the prose to be smoothly polished, the transitions clear and unconfusing, and the on-going exposition of the story easily laid before the reader—without condescending to us by laying all in our laps or going the other direction and

expecting us to figure important details on our own that should have been included in the text but weren't. Ansen Dibell has some trouble achieving this economy, especially so in the first half of the book. Either a character will go on for pages explaining names, devices, history, and motivation (which is important to remember later when everything becomes clearer), or in other places something will have happened entirely off-stage while a mental or verbal ellipsis on the part of a character is made that leaves the reader flipping back to see what he has just missed. In short, there is too much information given too soon, or not enough when needed. After several instances of this the reader starts to squirm in his seat, the book becomes tedious, and one can only hope he can see his way clear to make it to the second half, where much of this tendency is surprisingly corrected.



THE UNCERTAINTY PRINCIPLE  
by Dmitri Bilenkin  
translated by Antonia M. Bouis  
Macmillan, \$8.95

Reviewed by Patrick L. McGuire

**I**N HIS introduction to this volume, Theodore Sturgeon fantasizes about recruiting Dmitri Bilenkin for John Campbell's *Astounding* and *Unknown* in 1939. Campbell would have considered Bilenkin a real find, if only because of his ability to write competent stories of short length. Of the eighteen titles in this American collection, the longest has about nine thousand words, while most are only about three or four thousand words long. But whether the rest of us should be quite so pleased about Bilenkin's specialization is another question. Only three or four of the stories in this book are really first-rate, and I think part of the problem may be the constraints of the short form.

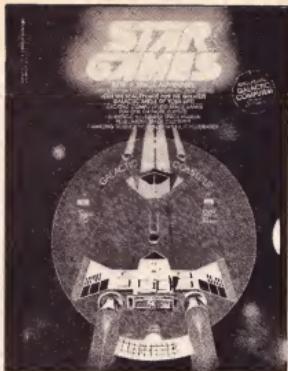
But first the good news, the outstanding stories: "What Never Was" describes dream therapy for the suicide-prone. The pictures of the hapless patient and of his doctor, too wrapped up in his new invention to see its shortcomings, are well drawn, and the ending, while predictable, also seems internally inevitable. "The Snows of Olympus" surmounts a weak finish. Up to the last couple of pages we have a fascinating realistic (if slightly outdated) account of an expedition climbing Nix Olympica on Mars, combined with reflections on why it is that people climb mountains. On the last page, the story suddenly turns into the eleven-billionth rewrite of "The Sentinel." There is some justification for the intended kicker (if humans have their reasons for climbing mountains, other creatures might do likewise from the same motivations), but the sudden jump in scale and drop in level of probability (humans will scale Olympus some day, but it's only remotely possible they'll find alien artifacts on top) detracts from the pleasure of an otherwise excellent story. By contrast, the last paragraph is the one that makes "Stranger's Eyes" a hard-science story about a Hal-Clement-style planet with a Scientific Mystery that turns out to be the result of a Dreadful Mistake on the part of Terrestrial explorers. The final few sentences go, "Leo was saying something, but I didn't hear him. I saw the black planet where we would have to spend many long years salvaging what could still be saved. The thought of the depressing hell that awaited us, strangely enough, brought me relief."

This same formula—subordination of traditional story elements to a supposedly intriguing idea capped off with a kicker—is followed in the remaining titles as well, but the results are less satisfying. The idea-plus-kicker pattern probably found its way into science fiction as a relatively effective way of meeting the editorial demand for extremely short stories, but it presents grave risks. Shaving down traditional elements such as plot and characterization to mere slivers, it stakes everything on the fascination of a new idea, or at least of a new twist on an old idea. And too often, Bilenkin's ideas just don't deliver. A cliche remains an untransformed cliche: the circle in time of "The Uncertainty Principle;" the scientist concealing his discovery for the good of humanity (set in a capitalist country, of course) in "The Ban;" the shape-

changing, ecologically harmonious life-forms of "Intelligence Test." To be fair, it should be added that some of these ideas may seem fresher to the intended Soviet audience than to American readers. And on the other hand, the American may not realize that in some stories Bilenkin is deliberately turning a Soviet cliche upside down. Until very recently, Soviet SF was filled with people dominating nature by brute force, but this volume contains no examples of that type, and instead has four or five stories taking a conservationist position.

Finally, beyond the merely competent stories, we have a few that Campbell probably would have rejected for low quality. Two or three of these set forth an idea and then just let it sit there, with little or no superstructure of plot. "A Mistake is Impossible" gives us an infallible career-guidance machine, and "The Man Who Was Present" depicts a human creative catalyst, a mortal Muse. For my money, ideas have to be a good deal more intriguing than these to stand alone. Other stories fail for lack of attention to detail. "The Uncertainty Principle" takes place in Western Europe in the Middle Ages. It's a pity Bilenkin didn't set it in medieval Russia, which he presumably knows something about, if only by cultural osmosis. Bilenkin knows nothing, and has failed to research anything, about the medieval West, and utterly fails to convey the atmosphere of the period. Finally, at least two stories, like all too much Soviet fantasy and SF, fail the test of logical consistency. "Hellish Modern" (*Adskii modern*)—Bouis renders it "Modernized Hell," which rather misses the point) is a deal-with-the-devil story which gains some depth from its comparison of an infernal functionary with a Soviet bureaucrat. But it loses it again by making Hell both break and obey its own rules at the same time. The Communist Party knows much better what to do when a mere rule gets in the way. Similar contradictions undermine "The Time Bank," which is supposed to be a whimsical story about a bank where you can deposit your wasted moments and then draw them out again.

Sturgeon quotes a Campbell dictum that SF stories for *Astounding* had to be logical, possible, and good; and fantasy stories for *Unknown* had to be logical and good. When Soviet writers get that word "logical" firmly into their heads, their fantasy and SF will take a giant step forward.



## STAR GAMES

Created by Jim Razzi, Rick Brightfield, Jack Looney  
Bantam, \$6.95

Reviewed by Marvin Kaye

**H**ESE IS a non-book which has some features to commend, and a great many more to censure. The complete title, *Star Games With a Space Adventure*, encapsulates all that is good and bad about this soft-cover activity set: clever concept wedded to derivative and sophomoric space-opera.

On the credit side of its ledger, *Star Games* provides a few hours of amusing pastime for adolescents who wish to project themselves into a galactic adventure scenario. The reader learns there is a great cosmic battle about to take place between Us and the "Evil One" alias Dark Horde (read: Darth Vader, Satan, Manfred, etc., etc.) and he or she can help by participating in the upcoming mega-battle. To do so means "enlisting" in the SpaceForce, studying its training manual and taking simulative tests, some of which, true to the title, are genuine games, though most are puzzles. Eventually, one "graduates" from space training and ultimately participates in the "Greatest Galactic Battle of Your Life," as the cover copy hyperbolizes.

Along the way, the book manages to convey a good deal of legitimate scientific information and theory pertinent to various hallowed science fiction concepts (anti-gravity, hyperspace travel, ionic propulsion, and even such mundanities as codes and square roots); thus, it is a sugar-coated way of drumming a bit of real and speculative science into resistant psyches.

Another charming feature of *Star Games* is a "Galactic Computer"—really a turnable wheel similar in

structure to old radio premiums—which is built into the cover of the book itself. (The instructions are to detach the cover and use the "computer" as a game aid during the progress of the adventure. However, any book-lover will quail at mutilating any volume.)

The idea of a sequence of games deftly interwoven with the developing action of any plot, science fiction or otherwise, is ingenious, distinctly irrelevant artistically, and probably an inevitability as games continue to grow in importance as an Occidental cultural institution. In this respect, *Star Games* is an important book.

Unfortunately, the very original concept behind *Star Games* is virtually ruined by the predictably adolescent vehicle with which Bantam and its "creators" (sic) have linked it. The fictional story is yet another Buck Rogers-George Lucas amalgam without the endearing naivete of the former or the eclectic genius of the latter.

It is a pity that science fiction, in mass media thinking, so often degenerates to second-rate cops-'n'-robbers on an interplanetary scale. *Star Games's* story will win no new champions for the genre.

The games themselves are a mixed bag. First of all, much of the pagination is taken up by a paramilitary space manual, complete with diagrams and sketches of spaceships and astronautic wear. Numerous activity pages en-



"We are all a bit puzzled. Our first identification of the remains was a *H. sapiens Neanderthalensis*—typical of man perhaps 35,000 to 150,000 years ago. And Tszu agrees. Of course, he didn't know they were found in the wreckage of an ancient spaceship."

—*Silent Trade* by Dave & Lin Poyer

"But you treat her badly, Frank," said the long dead voice of his mother from beside him.

Frank whirled. "Go away, Proteus. I don't want to hear any more."

"You have no one to blame but yourself, Frank. You are selfish."

courage the reader to fill out forms, learn coding procedures, compute hyperspace jumps, etc. There are well-done mazes, in which, for instance, the reader must find his way through a spaceship by threading his pencil-line in and out of complicated compartments, gangways, and corridors. There are secret messages to decipher, with the help of the wheel on the book's cover.

The one activity the book lacks in great abundance is—guess what? Yes, despite the title, there are precious few games in *Star Games*. Most of the activities qualify as puzzles, but only eight are legitimate competitions between two or several players.

The sophisticated game player will only find two of them interesting: a positional strategy battle supposedly concerned with computer "brain surgery," and the massive final space shootout which adds some clever twists to the popular Salvo/Battleships grid-search idea. The remaining half-dozen games run the gamut from familiar to tedious.

*Star Games* is a poor substitute for an ingenious idea that may yet be successfully achieved by some inventive author and publisher more interested in good science fiction than cashing in on the present emphasis on SF juvenilia. In spite of its noted virtues, the book is recommended only for SF novices and/or adolescents. —G—

## Telescope

Picture from "Court of the Timesifters." Illustrated by Kelly Freas

Frank drew the revolver at his side and shot the apparition of his mother. It slumped to the ground.

—*Phantom's Hell* by Michael Sutch

"Helen is the very soul of human rationality!"

"Human rationality?" repeated Holmes, raising his eyebrows so high they almost merged with his hairline.

"Yes, Mr. Holmes. You see, I am not exactly human."

"Then what are you, exactly?"

—*Desperation on Baker Street* by Coral M. Gaggiani



Lakeside

Inset: Parker Brothers

Parker Brothers

**BATTLESTAR GALACTICA;**  
P.E.G.S.  
Parker Brothers

**BLIP**  
Tomy Corporation

**INTERCEPT**  
Lakeside Games

**LASER ATTACK**  
Milton Bradley

**QUIZ WIZ**  
Coleco Industries

battery-operated and/or plug-in games.

One of the newest and most charming is Parker Brothers' *P.E.G.S.* (for Parker Electronic Game System), which the firm says is chiefly for children 7-14. This sells the product short; it is a versatile tool for sparking (pardon the pun) many traditional pencil-and-paper positional strategy contests, such as Tic Tac Toe or Salvo! Since it can be easily adapted to sophisticated game plots, *P.E.G.S.* should appeal to mature players as well as youngsters.

It consists of a sturdy-made, attractive plastic pyramid with 36-hole grids on its two widest sides. Players alternate thrusting rubber pegs into the holes. If a peg is put into a hole whose corresponding hole on the opponent's hidden grid is already filled with a peg, an alarm buzzer sounds. Alarms may signify penalties or rewards, thus all games primarily consist of players trying to avoid or locate alarm-sounding holes with their pegs.

The instruction booklet shows fifteen ways of using the *P.E.G.S.* system, beginning with simple games and progressing through such intermediate contests as, for example, Battle of the Blobs, and on to advanced games like Space Attack and positional translations of Soccer and Football. Despite the titles, all game plots necessarily are

**I**N A book on the U.S. toy-game business that I wrote some half-dozen years ago, I predicted a game renaissance as soon as Space Age technology was applied to new products. That time has come. More electronic toys and games than ever before appeared last holiday season, and prices are gradually spiraling down to a point where merchandise is now accessible to many consumers.

Because I believe the popular acceptance of sophisticated electronic games is an important cultural phenomenon, I mean to devote the better part of this and the ensuing column to a representative sampling of popular

# Games

Marvin Kaye

abstractions based on different alarm-sounding or -avoiding goals. Imaginative players can surely think up other games with this excellent product.

Coleco's *Quiz Wiz* is a computerized question-and-answer game that is a little like having a TV quiz show in one's own living room. An attractive, light-weight central Q&A unit comes with the first of a series of programmed cartridges and question books. (Other book/cartridge packages are sold separately.)

Players compete for high scores by punching in any of 1001 question numbers, then depressing multiple-choice answer button. A correct answer garners a clear tone and a green light; a wrong answer produces a rude buzz and a red bulb lights up.

*Quiz Wiz* is well made and moderately entertaining. Children find it addictive, but most of the questions are rather elementary for adults. If the company would take as much care to produce more challenging question books and perhaps other activities for the basic computer set, the product would enjoy a wider market, but at present, it is chiefly suitable for children.

The scenario for Lakeside's *Intercept*—stopping a rocket before it "blows up" one's air base—is reminiscent of traditional warfare simulation, but the manufacturer, belatedly aware of the SF current trend, has tailored its TV commercials to make *Intercept* look like a battle between a pair of Darth Vaders.

But however it is characterized, *Intercept* is an engrossing tactical battle in which electronic location and attendant sound effects greatly enhance the play experience. In it, the first player has ten moves to secretly advance his "rocket" to a point where he can "destroy" the enemy air base. The other player tries to find where the "rocket" has successively stopped on the playing grid. If he succeeds, that space lights up and a whooping sound is produced; if he fails, the sound of "rockets zipping into the air" informs him so. At the end of a round, the players switch positions and objectives.

*Intercept* is well-made, appealing to the eye, and is an excellent battle of wits that demands the utmost ingenuity of each player; two well-matched opponents must vie for points (i.e., how far the "rocket" invades enemy territory before detection), because it is exceedingly difficult to maneuver all the way up to the air terminal at the far end of the playing grid. Recommended for players of all ages.

Budget-minded gamesters may wish to purchase Tomy's heavily-advertised *Blip*, a digital dexterity contest that may be played by two players or by one

against the machine itself. A kind of tennis match, *Blip* bounces a glowing red dot from one side of the screen to the other. The dot may stop at any one of three places; the player must guess where and press the serve button at that position before the dot comes to rest—a hard task, because the dot's trajectory may change at the last split-second.

Tomy boasts that, unlike TV-screen games, *Blip* may be taken anywhere and played without attaching it to the family television. This is true, but hardly important; *Blip* will never be a serious substitute for such grandiose products as *Odyssey* (Magnavox) or various Coleco television game systems. The construction is unimpressive (a flimsy scoring device was defective on the review sample). Some may regard it as a relatively economical stopgap, but I suggest saving one's money till a better game can be bought.

*Laser Attack*, like *Blip*, runs on flashlight batteries, but there the similarity ends. Milton Bradley's spacey adventure is quite enjoyable for youngsters, is well made, and the design is a visual knockout. The plot is not merely forced into SF channels, but is a carefully-devised space-opera scenario that provides opportunity for skilled play balanced by a fair amount of luck.

According to the rule book, a deadly laser-armed spaceship has invaded the Solar System and must be stopped by plugging its ports with energy pods that will cause the laser to self-destruct. But first, players must gather the pods from their orbits, all the while running the risk of being blasted by the enemy's laser beam. In game terms, players try to collect plastic "pods" and be the first to plug up the holes of a black plastic dome (the alien ship). But the dome contains whirling flashlight bulbs and at the end of each turn, it must be spun. If the light-ray falls on a pod, it may be forced into a remote corner where it will be hard to retrieve, or it may be blasted out of the game completely. The first player to plug a dome-port and have such an inserted pod illuminated by the spinning light wins.

An especially attractive feature of *Laser Attack* is the lovely colors the light-ray produces as it shines on plastic playing tokens. Even children afraid of the dark may risk dimming the lights to see *Laser Attack* at its visual best.

A note on power sources: Many electronic games require more power than can be supplied by AA-size flashlight batteries. *P.E.G.S.*, *Intercept* and *Quiz Wiz* all need 9-volt batteries to operate. Because of their long life, Duracell 9-volters are to be greatly recommended.

More economical in the long run is a 9-volt battery eliminator, such as Radio Shack's #270-1552, a fine piece of

equipment that also recharges used 9-volt batteries from household current. Coleco's *Quiz Wiz* is also built to accept a GE input-output battery bypass. However, the instructions in *Quiz Wiz* warn consumers not to use any battery eliminator but one made by Coleco, for fear of damaging the game's circuitry.

This *caveat* aroused my suspicion. Replying to a demand as to why *Quiz Wiz* cannot accept a GE or Radio Shack adapter, a company spokesman admitted the product "can use a wide range of adapters," though other Coleco electronic products cannot.

It would behoove Coleco to present exact adaptability information to consumers instead of misleading them with self-serving half-truths.

*Kudos for Parker Brothers:* Parker now operates a toll-free "hot line" which purchasers of *P.E.G.S.* and other Parker electronic games may call for vital information on operation, repair, etc. This action surely deserves considerable praise; the venerable New England game firm obviously really cares about the consumer.

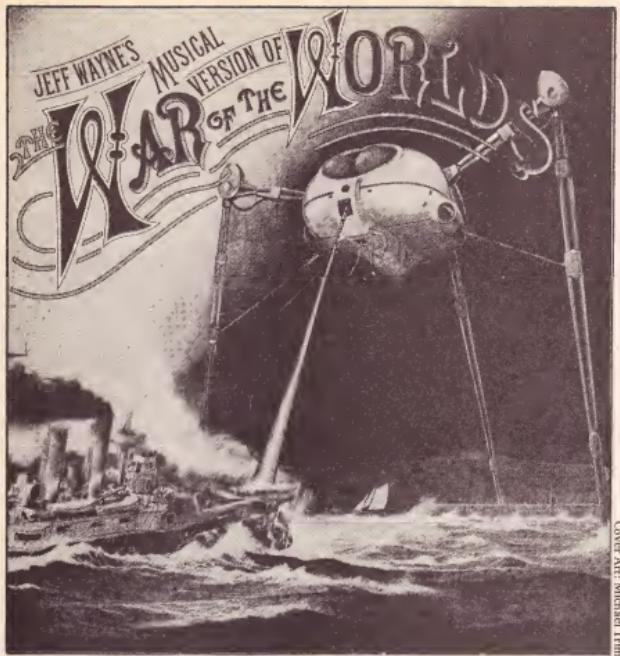
*Followup on tie-in products:* Our first review column looked at games based on the films *Star Wars* and *Close Encounters of the Third Kind*. Shortly before press time, yet another licensed game was rushed into the stores: Parker's *Battlestar Galactica*. Here is its plot as described in the rules:

"A Cylon Raider—disabled and abandoned—floats defenseless in outer space. As a combat training mission, four new Colonial Viper pilots are each assigned to capture the Raider and bring it to the Battlestar Galactica for inspection. On this mission, the pilots are ordered to simulate actual combat conditions..."

On a board that contains purple planets and black holes, players move tokens toward the "radar" token. Whoever captures it races to return it to his starting position. But opponents may engage him in battle and take away the "raider" (i.e., they may land on an adjacent square and force a whirl of the too-familiar game spinner. Various cards drawn during the game permit "firing of laser torpedoes" or use of a "force field" to disadvantage an opponent. An unusual feature is the ability to land on a black hole and "warp" to a distant part of the board on the instant.

*Battlestar Galactica* is a brave try on Parker's part to create an imaginative game; it has some elements of challenge for intelligent, young game buffs. But it takes a little too much luck to win, and the game palls rather quickly. Yet considering the program on which it is based, it is very good by comparison.

—G—



Over Art: Michael Trim

# Entertainment

David Gerrold

**I** WILL not even try to be objective. I *love* this album! It is the first time a record album has achieved the kind of mythic stature that previously was seen only in motion pictures like *The Wizard of Oz* and *King Kong* (1933) and *2001: A Space Odyssey*. This is a work of art—it pushes back the boundaries of what was previously believed possible for the recording art and establishes a whole

new territory for development—an unembarrassed *Gosh-Wow!* of an album.

I've been waiting for a record this good since *Abbey Road*. It is much more than just a very effective fusion of music and story—it is a whole new approach to storytelling. It is a narrative rock opera—with the music served up not only as songs, but also as aural environments, sound effects, and powerful hypnotic rhythms to serve as

emotional signposts for the listener—adapted directly from the original text of the novel. It is a rich panorama of a world ripped apart, a lush banquet for the eyes and ears, a feast of beauty and horror—go ahead, let your tired sense of wonder wallow shamelessly here. This one is definitely a Hugo contender for the Best Dramatic Presentation award—in fact, this album is probably the best argument in years that the Hugo ballot ought to be expanded to include a Best Recorded Presentation category; it just isn't equitable that a work like this—which will probably not receive the attention or establish the impact of a motion picture—should have to compete in the same category with films and television shows.

What it is, is this:

First of all, it is a two-record set containing some 96 minutes of performance. (Side one runs 21 minutes, sides two, three and four are closer to 25.) Second, it is a folio of art so evocative that it could put some multi-million dollar movies to shame. The outside cover of the album, painted by Michael Trim, is a double-sized spread showing the battle between the warship *H.M.S. Thunder Child* and a towering, terrifying Martian war machine. The war machine is alien and insectoid and closely matches the descriptions in the original novel: it stands tall on three slender legs, culminating in a rounded body with a hooded window like two huge green eyes. Open the album and the inside is another double-sized spread, this one by Peter Goodfellow, showing the landing place of the first cylinder on Horsell Common; it glows with an unearthly sheen in the middle of a misty English wood.

Then there is a 16-page, full-color booklet which contains all of the written narrative, all of the song lyrics, five more double-sized paintings plus smaller reprints of the two cover spreads, and the recording credits. All of the paintings are stunning, and they represent the work of three different artists: Michael Trim, Peter Goodfellow and Geoff Taylor. I don't know who these people are, but I want to see more of their work! They know their science fiction. Their imagery is brutal and uncompromising. Good for them! Goodfellow's most dramatic painting shows a panicking crowd fleeing down a London street while a towering war machine devastates the buildings behind them. It is the last painting in the booklet, however, that is most disturbing. Here is the ultimate death of the Martians, their war machines tumbled and fallen in the ruins of London, one with a broken windshield and something bloody dripping out of it. A flock of savage blackbirds are tearing at the ripe

flesh of the dead—and still *unseen*—Martian invaders.

On the back page of the book are biographies of the eight principal figures in the production of this album, and they are a powerhouse cast indeed:

Richard Burton is the voice of the journalist-narrator and he is at his mellifluous best; his crisp Welsh accent pulls you into the mood of the story with the very first words he utters, and his performance throughout the album is compelling. He is the voice of a methodical journalist and he is the heart of human compassion as he relates the details of the Martian invasion and the reactions of the human beings around him.

The first two songs, "The Eve of War" and "Forever Autumn," are sung by Justin Hayward of The Moody Blues. Both the songs and performance are superb, particularly "Forever Autumn"—which was written in 1972 and adapted for this album. The familiar lush Moody Blues sound is here, and it is a richly appropriate evocation of the narrator's sense of loss when he discovers that Carrie, his love, has already fled London.

Chris Thompson of Manfred Mann's Earth Band is equally superb on "Thunder Child," the ballad (illustrated on the cover of the album) tells of the last great battle between humanity and the Martians: the valiant attack of the H.M.S. *Thunder Child* on three of the tripodial war machines. The song gives you a moment of hope, a single dream of resistance—and then crashing despair as the *Thunder Child* is blasted. It is a moving finale to the first half of the album—which is subtitled, "The Coming of the Martians."

The second half is subtitled, "The Earth Under the Martians." Where the first two sides concentrated on the telling of the invasion, this half relates its impact on humanity, and a devastating impact it is, indeed. There are three more brilliant performances to grab you.

Philip Lynott (of Thin Lizzy) and Julie Covington (of the rock opera, *Evita*) as Parson Nathaniel and Beth are heart-wrenching. These people have an ear for madness—Parson Nathaniel is convinced that demons have overrun the Earth and all is lost, and Beth, his perhaps equally-bewildered wife, still clings to a dream of hope. Covington's performance on "The Spirit of Man" is somehow *understated* and yet still manages to be one of the most emotional and captivating performances of these two discs, a fittingly appropriate counterpoint to Lynott's loud despairing cries to "let the devil take the spirit of man." This is the stuff of which show-stoppers are made.

But it is David Essex who is the real

star of this spectacular; as the voice and soul of the Artillery Man, he demonstrates a range of both singing and acting that is nothing short of amazing. His performance on the song "Brave New World" takes him from the rage and power of a mighty dream of tomorrow to the depths of futility—a different shade of madness.

The backup band is made up of Chris (Sharks) Spedding and Jo (Kiki Dee, Elton John) Partridge on guitars, Herbie Flowers on bass, Barry Morgan on drums, Barry Da Souza, Roy Jones, and Ray Cooper playing percussion, Ken Freeman and Jeff Wayne on keyboards and synthesizers, and George Fenton on zither. Special mention must be made of Jo Partridge's evocation of the heat ray—it is a chilling sound by itself; as a continual motif throughout the album it becomes a terrifying presence, and just the barest touch of it in the album's fittingly appropriate epilogue is enough to make the short hairs on the back of your neck stand up straight and scream.

Writing credits on the album include Gary Osborne as lyricist, and Doreen Wayne as scriptwriter. "Forever Autumn" was written by Gary Osborne and Paul Vigrass. The dramatic and narrative sections were directed by Charles Budin and Jerry Wayne (who also executive produced; he is Jeff Wayne's father). The musical production chores, of course, were Jeff Wayne's; he also composed, orchestrated, and conducted; his is the unifying artistic view here. All of the highest kudos to him for drawing these varied elements into a whole that is more, *much* more, than just the sum of its parts.

Wayne has gone beyond the tradition of a "concept album"—he has invented a new genre: the motion picture of the mind. The music is hard-driving rock, appropriately cataclysmic. And as I started to say above, the music is used as more than just music—these strange unearthly textures become an aural environment, a portrait of mood and emotion and event: when the lid of the first cylinder begins to unscrew, for instance, are we listening to a sound effect or a musical phrase? It is both at once. When the Martians begin to advance across the quiet English countryside, are we hearing motifs to represent their searing heat rays and the metal whine of their machines, or are we listening to the actual sounds? When those motifs begin to intertwine into a thread of relentless themes and grinding harmonies, are we still listening to an unseen movie's sound track or a symphonic portrait of a world ripped apart? Wayne has used the chords and rhythms of rock to create the mood of nineteenth-century England—no, I

didn't think it was possible either; but it works, he's right, he's caught that whole industrial naivete of the time, its belief that anything is possible with science—and then given it an enemy that is almost incomprehensible to the people of that simpler time; the Martians are painted in melodies that are subtle and sweetly discordant and as fascinating as opium, and ultimately as maddening and destructive. To us—who live in a day when lasers and space travel are taken for granted, if not yet commonplace—the terror of such an invasion is at least a comprehensible one; to the quiet folk of an earlier England, it is a cosmically unjust insanity. Wayne has stunningly evoked the panic, madness, and despair of such an event; it is in the fusion of the carefully written narrative, the mind-pictures of the songs, and the unrelenting power of the music that he has woven a tapestry of sound, threading motifs and themes together to create a listening experience that is simultaneously horrifying and beautiful. It is haunting. The album transcends itself as just one more version of the granddaddy of all invasion stories and becomes something more, a commentary on human dreams and aspirations as told through human fears.

The recording and sound quality, by the way, are exceptional. If you have a truly high-powered sound system, this album will give it a hefty workout, and in the process, demonstrate all the best things that a good set of speakers is capable of. The sound is crisp and clean and sharp; and recording engineer Geoff Young is to be praised for his mixing and mixing: the performances deserve no less than the best and he has delivered it. Also worth noting, the record surfaces here are extraordinarily quiet for a commercial pressing, almost as good as those on the fifteen dollar direct-cut discs. A very special thanks to Columbia Records' quality control department, which has established a standard for excellence that should serve as an example to the rest of the industry as to what is possible with care. Bravo, guys, bravo!

Here is a record to wallow shamelessly in; it has a lot more meat on its bones than all those mindless rip-offs of *Star Wars* and *CE3K*, and it's a well spent entertainment dollar. On a scale of 10 (10 being *Abbey Road*, 2 being *Donnie Osmond*) this is a 10! The program notes indicate that this is only the first in a series of works by Jeff Wayne. Well, he's won me over. Call me Oliver Twist. "Please, sir, can I have some more?"

—G—

# Opinion

Robert Silverberg



T THE World Science Fiction Convention held in Phoenix not long ago, I met Samuel R. Delany for the first time in six or seven years, and we held a friendly reunion. The last time I saw Chip, he was hidden behind a vast frizzy Afro and an awesome shaggy beard; now, hair and beard neatly trimmed and tinged a bit with gray, he looked more like a stolid and successful banker than a radical *enfant terrible*. I think his exterior has altered more since the early 1970s than has his consciousness, but, nevertheless, when we talked of our current literary projects, he described the book he is writing as "space opera." And I said I was about to embark on an "epic fantasy." These are not the categories one thinks of when one thinks of the New Wave in science fiction, and yet Delany was a quintessential New Wave writer, and to a lot of people so was Silverberg. Obviously, more things have been changing than the cut of Chip Delany's hair.

The New Wave was something of a conceptual gimmick—a notion invented by some trendy book reviewers around 1966 to categorize the literary upheaval going on in the world of science fiction. In the old days—say, 1939-'53, the Campbellian Golden Age—literary workmanship in science fiction had ranged from the primitive upward to the functional; except for a few oddities like James Blish's "Testament of Andros" and Theodore Sturgeon's "To Here and the Easel," nobody tried much fancy stuff, much variation on the basic traditional commercial methods of telling stories. The best style was the

most invisible style; the best way of constructing a story was to begin at the beginning and move along briskly toward the end.

These are sane and sensible principles, and I mean no mockery of them. But as the primary themes of SF were explored and re-explored and fairly well exhausted by the likes of Heinlein and Asimov and DeCamp and Leiber and Kornbluth and Sturgeon and Van Vogt, writers began looking, a bit desperately sometimes, for ways to give their work a jolt of new energy. Thus, Alfred Bester in 1951 adopting a jazzy, hyped-up prose style. Thus James Blish about the same time, drawing on his knowledge of the literary theories of James Joyce. Thus Ted Sturgeon quietly writing whole chapters in iambic pentameter. Thus Philip Jose Farmer almost single-handedly adding a fascinating component of eroticism to the traditional matter of SF.

Then came the long interregnum of the late 1950s, when science fiction seemed to stagnate; and, when things got lively again in the early 1960s, a whole crew of new writers was on hand, gifted, restless, well educated, unwilling to do things the way Heinlein and Asimov had been content to do them. In came Delany and Zelazny and Lafferty and Disch and Malzberg and Spinrad to astound the American readership. In England a coterie developed around Michael Moorcock's radical magazine *New Worlds*—Ballard and Aldiss and Keith Roberts and Moorcock himself. Although there was no formally structured movement, Moorcock's magazine and London flat served as a definite focal point for concentrated change, as did Damon Knight's house in Milford, Pennsylvania. And the new approaches to the writing of science fiction, the denigration of plot and incident, the importation of experimental methods from all of the twentieth-century world literature, the emphasis on dilemmas and conflicts of contemporary society, were pervasive indeed. Not only the new writers rallied round; such veterans as John Brunner, Harlan Ellison, Philip K. Dick, and, yes, Robert Silverberg, found themselves classed, not unjustly, as part of the New Wave.

Waves crest and break and retreat, though. In the delirious ferment of the late 1960s, when old editorial restraints were being cast off and bold new voyages attempted, it was too easy to forget that science fiction is not only a literature of infinite scope and mind-

shaking visionary power but is also, and perhaps primarily, a branch of commercial adventure fiction consumed largely by adolescents. There we were, playing at being Joyce and Kafka and Eliot and Mann—and being taught in the universities as though we were—and there were the readers, frowning and muttering, picking up the books and puzzling through them and putting them down in despair or annoyance or downright rage.

And now Chip Delany is working on a new space opera and Robert Silverberg is concocting an epic fantasy, and where is the New Wave, and did it crash on our shores to no effect? The New Wave writers, I think, are alive and well, and the revolution of the 1960s, having emerged from its period of zealous excess, has had its impact. We no longer are subjected to much of the hermetic avant-garde that characterized the New Wave at its most righteous; but the *average level* of literary accomplishment in science fiction stands far beyond where it was in 1955, the emotional range of science fiction is far greater, what we write is richer and deeper. And the readers seem happy. Books that tell bold, simple, comic-booky stories are still apt to sell better than those that tell complex and disturbing fables, but that's inherent in the mass-market system, and is no cause for wailing. The so-called New Wave, for all its crazy excess, for all its unreadable experiments, for all its downright failures of execution, served a valuable function. It blew away the stale, the routine, the decayed. In order to win the freedom to be literate we first had to allow ourselves to be literary; and now, with the battles behind us, we have settled down to tell our tales, unashamed to begin at the beginning and end at the end. Plot and character and incident have become respectable again. (They were always *necessary*, but for a while they were embarrassing.) Even as Homer was, we are content to hold our readers by making them wonder what will happen next. But in the post-New Wave era we can write as adults for adults, and not apologize for it. It may have been worth all the nonsense we had to wade through circa 1967 to reach that point.

—G—

a cable stopping negotiations and followed up with another visit by Lombi to resolve the matter. I had been told by the two American scoundrels that I was part of the deal, but I didn't want any part of it. Lombi arrived by plane and we began looking for a better buyer. A number of outfits were interested, but, as I said, we were becoming great friends with the printing broker, Bob Guinn, and I got him to make a bid. I don't know how much, but Lombi made the sale with the Riviera man's blessings. No sooner had Guinn bought the magazine than the inside job became clear to Lombi. The distribution pattern had been deliberately loused up—by shipping *Galaxy* all over the South, where there was practically nobody interested in science fiction, and into rural hamlets all over the North and West. Lombi called his boss and told him of this sabotage. The guy on the Riveria told Lombi to buy back the magazine from Guinn. When the two men met, Lombi was shocked at Guinn's asking price: it was four times as much as they'd been paid! Guinn grinned and told him that he, Guinn, knew what he was buying, whereas World Editions had no idea what they were selling. Lombi went home, but not in dishonor. I hated to see him go. We'd had a fine relationship.

**Elliot:** How did *Galaxy* fare under Guinn's stewardship?

**Gold:** Guinn was good to work for. He left the magazine's policies, decisions and rates up to me, and he involved me in the various advertising and distribution problems. I mention advertising because World Editions had, over my protests, run a back cover ad for a book called *Confessions of a French Chambermaid*. The result was that we lost 10,000 readers for each of the three months of the contract. *Galaxy* went to the top of the field after that, never to lose ground again.

**Elliot:** Given *Galaxy*'s tremendous success, why did you decide to retire?

**Gold:** I had eleven memorable years, 1950-1961. Unfortunately, I was in a disastrous car crash that finally wore me down to 126 pounds and eventually into the hospital with a poor chance of my ever being able to walk again. I was there for a long time, till my weight was back to normal and the crippling cured. I remarried around that time, precisely at the moment of the big build-up in Interview

South Vietnam. Then I suffered a slight stroke and was forced into retirement. The only remaining paralysis, however, is of the left corner of my mouth and a minor but very frustrating speech impairment. I'm gradually finding my way back to the typewriter, though I'm completely out of practice, and words don't flow the way they did when the typewriter was an extension of my fingers and mind. However, it's coming back—and you'll be hearing of me again—soon, I hope, but eventually for sure.

**Elliot:** Finally, have you ever thought of going back to editing?

**Gold:** Not magazine editing, for two reasons. First, I don't have the vigor to entice or pull the best stories out of the best writers against those damnable deadlines. Second, science fiction magazines can't compete with paperback

anthologies, which pay better, and pay royalties as well. Moreover, anthologies can be left on the newsstands indefinitely and in more places, such as supermarkets and drugstores. I may, if things work out right, however, edit an occasional theme anthology—books, in other words, definitely not magazines. As for the rest of my time, I count my blessings—and they are many—a beautiful, wonderful wife, a fine son and daughter-in-law, four totally satisfactory grandchildren, and two wonderful, beautiful step-daughters and a splendid stepson. And I wouldn't take a million Swiss marks for the memories I have of being about as good an editor as John Campbell and Tony Boucher were. That took some doing. But nothing could induce me to do it again. Anyhow, it wouldn't be safe for the world, would it? —G

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# Inquisition

## Letters

**D**

EAR MR. RYAN,

May I take this opportunity to urge you to run some stories by Thorkel Fringe, the Icelandic SF writer whom Anthony Maxwell mentioned in his letter in your last issue. I, like Mr. Maxwell, have also had a brief taste of Fringe's work and hunger for more. I read a short story of Fringe's in his *Paths of the Stars* collection (which I have since lost). Fringe's story "On the Shores of White Sand by a Blue Sea"—the title may have been something entirely different in Icelandic—still comes to mind. It was about the finding of the first really habitable planet for human beings outside of Earth. What moved me in my reading was the recounting of how long and arduous the search for such a planet was, and the dreariness of life on planets with unsuitable habitats for mankind (I suppose Fringe never thought of terraforming). The story was part of a series by Fringe about the exploration and conquering of the galaxy by mankind called *The Empire of Man*. I'd be grateful if you would reprint that story. No one I've asked knew of the book or had ever heard of Fringe until the letter in your magazine. So please run some stories by him so everyone will know what I'm talking about. It's very lonely being a Fringe fan.

Robert Brook  
Portland, OR

We can find no information about Fringe anywhere, and would like to know more. Can anyone tell us anything about him? A Fringe fan indeed.

—Ed.

Dear Mr. Ryan,

You have asked our opinion of the three cover stories you published in number ten and since I have the opportunity, I will venture my opinion. I

found it quite odd—unfitting as a matter of fact—that Mr. Potter chose a biblical reference, Cain, to describe a very secular plot evolution. Obviously, the australopithecines have no relation to Cain besides their violence and that in itself was not Cain's vice.

I found the concept of "A Song of Life" one that was quite believable and entertaining. Its delivery, however, lacked something in the way of originality of style in that it was such a long soliloquy. This style (or lack of it) made the story rather monotonous toward the end. It began to resemble an entertaining lecture about something you know nothing of—right down to the technical jargon, or one of those happenings you overhear your aunt tell, full of names of people you've never met.

Finally, "The Negotiator" was, by far the best of the three. Mr. Corry presented M'kolek and thus all Smaeket as being ignorant of the danger involved. Little did the reader know that

it was he who was ignorant of the power of the creature, M'kolek. If Mr. Corry has a fault it is in his portrayal of Lysette in that she was not quite feminine enough. However, seeing as I don't know her very well, she just might be that kind of woman—it would certainly follow if she grappled with Here-am-I's enough times.

One other story that I would like to comment on is "The Midnight Bicyclist." I was quite offended by it as I'm sure (and hope) others were. Striving for something different, the authors lost all grip on analogy. Rather than resurrection, the inhabitation of Art's "vehicle" was more closely analogous to demon possession. No matter what their arguments, demon possession and resurrection cannot be compared—with any hope of a logical conclusion, that is.

Please don't be misled into thinking that only indulge in the fiction of your magazine. Indeed, the articles are what makes your magazine much more than

### THE GALILEO PRIZE

Last year, Galileo awarded three prizes to the authors of the three best short stories under 3000 words which we received from contributors during the previous year. We intended (and still intend) for the Galileo Prize to be a permanent feature of the science fiction landscape, but we are unable to award it this year. The fact of the matter is that during 1978 we didn't receive three stories under 3000 words which were prizeworthy.

We have not given up on the short short story yet, however. We like short short stories and, frankly, we find that we need them to round out every issue. So we're raising the ante. The prizes are no longer \$100, \$200, and \$300. As of now, the prizes are \$200, \$350, and \$500. If you are a writer, bear in mind that these prizes are awarded in addition to the regular payment made for an accepted story.

And we have decided that a maximum limit of 3000 words is too restrictive for today's SF writer. From now on, the prizes will be awarded to the best stories between 2000 and 5000 words. We will award the prizes again during 1980, based on the stories from 2000 to 5000 words which were submitted during 1978 and 1979. After that, we will go back to judging one year's worth of stories at a time. Fair enough?

Only stories which are previously unpublished are eligible for the competition and any story submitted to us is considered both for publication in Galileo and for the Galileo Prize. All stories submitted must be accompanied by a self-addressed envelope with postage sufficient for its return to the author.

some others. I find them enlightening as well as enjoyable and I feel they are a must in order to keep the public informed as to scientific advances and aspirations. Perhaps an article about chemistry's affect on the future could be published?

Philip Hurley  
El Paso, TX

Dear Mr. Ryan,

I have always enjoyed reading the "Pro-File" in your magazine—as hokey as it is—because it seems to give interesting information about some of the authors. On the other hand, I am not sure how much I can trust this information when you attribute to Olaf Stapledon *First and Last Men*. I have read a great deal of Olaf Stapledon and I am fairly confident he never wrote a book called *First and Last Men*. He did write a book called *Last and First Men*, however, and later wrote one called *Last and First Men in London*. Could you have been thinking of *Last and First Men* when you wrote *First and Last Men*?

Ampico J. Steinway  
Philadelphia, PA

**Profile**  
(continued from page 7)

story, "Changeling" appeared in issue 11-12. An English professor at Washington and Jefferson College in Pa., the author is also a prize-winning poet whose verse has been published in numerous magazines, including *The Kenyon Review*, *Poetry Northwest*, and *Southwest Review*.

There's an unmistakable Willisian humor evident in her stories. Simply, she's writing some of the most subtle and entertaining science fiction around. Connie Willis makes her third appearance in *Galileo* with "Homing Pigeon," a delightful story about "what housewives do all day." We once said Ms. Willis lived in Connecticut with two cats, an eight-year-old, and a husband who is a physics teacher, but Ms. Willis, it seems, lives with all the above and "Montmorency," an English bulldog, in Colorado. At present, Ms. Willis is collaborating with Cynthia Felice ("Only Human Eyes Can Weep"—issue 11-12) on a science fiction Gothic; a genre whose arrival they are certain somebody has long awaited.

Our interview subject this issue is H.L. Gold, the founder and former editor of *Galaxy* magazine. Gold made his reputation first as a writer producing such classics as *Trouble with Water* and *None But Lucifer*. However, he is equally famous for his editorials while at *Galaxy*, which have been collected recently in *What Will They Think of Last?* His first published science fiction story, "Inflexure" appeared in *Astounding* in 1934 under the pen name, Clyde Crane Campbell. —G—

Letters/Authors

# Best Sellers

Compiled as of April 1979

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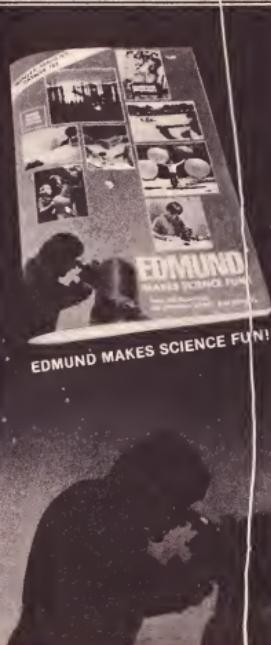
1. **Convergent Series**  
Larry Niven: delRey
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## HARDCOVER

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2. **The White Dragon**  
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3. **Harpis in the Wind**  
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